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ABSTRACT

Responding to the demands of the Clean Air Act of 1970, the Manpower Development Staff of the Office of Air Programs has acted to provide more and better-trained practitioners in the field of air pollution control. Numerous courses are conducted through the Institute for Air Pollution Training, while university training programs are administered by the Special Projects Branch of the Manpower Development Staff. Detailed in this booklet are the courses, training programs, requirements, and schedules offered by the staff from July 1972 through June 1973. For the Institute for Air Pollution Training, descriptions include: (1) a chronological schedule of all training courses; (2) regional offices of the Environmental Protection Agency; (3) general course information and requirements; (4) lists of adjunct and resident faculty; (5) regional training locations; (6) course descriptions for orientation courses, the basic course, APEX simulation exercises, and advanced courses; and (7) schedules of resident and field courses. Headquarters for the Institute is The National Environmental Research Center, Research Triangle Park, North Carolina. The section on university training programs summarizes graduate programs in 23 universities and 10 specialist training programs. Also described are the Special Projects Branch of the Manpower Development Staff, the University Consortia for Environmental Protection, and fellowship support opportunities. (BL)

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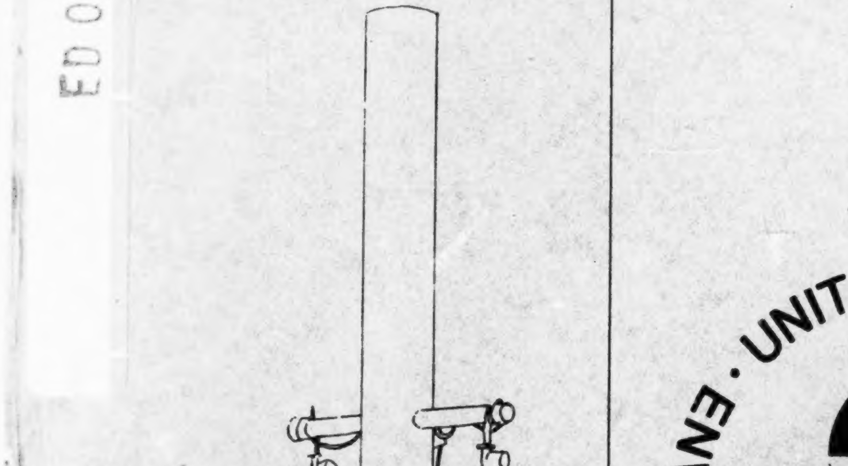

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

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# July 1972
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UNITED STATES
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Office of Air Programs
Manpower Development
Institute for Air Pollutio

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# Air Pollution Training Courses July 1972 through June 1973 and University Training Programs

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
Office of Air Programs
Manpower Development Staff
Institute for Air Pollution Training

1 A

# Air Pollution Training Courses July 1972 through June 1973 and University Training Programs

## United States Environmental Protection Agency

**Institute for Air Pollution Training**

**Special Projects Branch**

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
Office of Air Programs
Stationary Source Pollution Control Programs
Manpower Development Staff
Research Triangle Park, North Carolina 27711
July 1972

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# Introduction

On December 2, 1970, the President created the Environmental Protection Agency and named William Doyle Ruckelshaus as Administrator. Air pollution, water pollution, solid wastes management, radiation protection, and pesticide control programs were joined in a new Agency that possesses a greatly strengthened ability and a unique coherence in the struggle to improve and to control the quality of man's environment.

In the same month, the President signed the Clean Air Act of 1970. The impact of this action on both the public and the private sectors of the country will be far-reaching. The Manpower Development Staff of the Office of Air Programs has acted to meet the demand, created by the Act, for more and far better-trained practitioners in the field of air pollution control.

During Fiscal Year 1972, more than 3000 trainees completed courses conducted by the Institute for Air Pollution Training.

Through university training programs administered by the Special Projects Branch of the Manpower Development Staff, the following were trained:

Fiscal Year 1971

| | |
|---|---|
| 140 | Technician |
| 60 | Bachelor of Science |
| 200 | Master of Science |
| 60 | Doctor of Philosophy |
| 4 | Post Doctoral |

Fiscal Year 1972

| | |
|---|---|
| 125 | Technician |
| 50 | Bachelor of Science |
| 175 | Master of Science |
| 50 | Doctor of Philosophy |
| 4 | Post-doctoral |

The Office of Air Programs has also supported the following number of individual fellowships to complete specific research projects:

| | |
|---|---|
| Fiscal Year 1971 | 42 |
| Fiscal Year 1972 | 44 |

The computer-based simulation exercise APEX (Air Pollution Exercise) is being widely accepted throughout the country. Twelve universities now utilize the program in their graduate environmental courses. Demonstrations of the program continue to be conducted at other universities in response to a growing number of requests. In addition, the program has been initiated in the Regional Office areas for their staffs and other environmental training specialists. The demand has been so great that it was necessary to develop and establish a impact of this action on both the public and the private sectors of the country will be far-reaching. The Manpower Development Staff of the Office of Air Programs has acted to meet the demand, created by the Act, for more and far better-trained practitioners in the field of air pollution control.

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The Institute for Air Pollution Training, headquartered at the Research Triangle Park, North Carolina; designs, develops, and conducts a variety of training courses, seminars, and workshops. The primary objective of the Institute is to develop and improve the knowledge and skills of personnel employed in air pollution control activities. To implement the Environmental Protection Agency's decentralization policy that was designed primarily to bring expertise to local problem areas, the Institute for Air Pollution Training has expanded its course offerings to the training locations in each region.

The Institute for Air Pollution Training presents a three-tiered plan for training air pollution control personnel.

First Tier – Orientation Courses

Packaged instructional courses are supplied to state and local agencies to enable a new employee to begin his training immediately after reporting on the job.

Course 422-A, "Introduction to Air Pollution Control," is an orientation course composed of a set of packages that represent the revised version of course 422-A, which was validated during FY 71-72. The instructional packages are: Air Pollution Law, Air Pollutants and Their Sources, Effects of Air Pollution, Sampling and Analysis of Air Pollutants, Control Techniques for Gases and Particulates, Meteorology in Air Pollution Control, Air Pollution Control Regulations, Air Quality Management and Enforcement Systems.

Course 422-B is a series of printed booklets in a programmed instruction format. The packages include: Air Pollution Effects on Man, Air Pollution Effects on Vegetation, Air Pollution Meteorology, Legal Aspects of Air Pollution Control, Sources and Pollutants and Air Pollution Control Technology.

Course 422-C consists of a series of instructional packages that provide an examination of air pollution in greater depth. These mini-courses feature special areas of air pollution control that are not generally covered in courses 422-A and 422-B.

The broad content of these orientation courses makes them particularly useful for all new state and Federal air pollution control agency employees. Schools, environmental education programs, and industries can use the materials to introduce key employees to the study of air pollution control.

Second Tier - Basic Course

"Principles and Practice of Air Pollution Control," the basic training course, provides a broad understanding of air pollution control in addition to the development and application of selected skills. This 2-Week course is offered 10 times each year at the National Environmental Research Center, Research Triangle Park, North Carolina. This basic course – or its equivalent in graduate training or in air pollution control experience – is a prerequisite for entry into the advanced courses. The course is strongly recommended for all new professional and technical employees as soon as possible after entry on the job.

Third Tier – Advanced Courses

A number of advanced courses are conducted by the Institute for Air Pollution Training. Highly-specialized courses, ranging from one to two weeks in duration, provide intensive training, usually at the graduate level, in air quality management, and the current elements and methodology of air pollution control. Several of the courses provide opportunities for extensive laboratory practice. These are described in the Advanced Engineering and Enforcement and the Advanced Surveillance and Laboratory course descriptions.

Special Training

The new laboratory facilities, provided for the Institute's training activities located in the National Environmental Research Center, now make it possible to provide special training beyond formal courses. The training is available to laboratory and surveillance personnel. This special training emphasizes the application of reference methods performed on an individual basis. Consideration will also be given to other problem areas.

Harry P Kramer

Director,
Manpower Development Staff

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Center, Research Triangle Park, North Carolina. This basic course — or its equivalent in graduate training or in air pollution control experience — is a prerequisite for entry into the advanced courses. The course is strongly recommended for all new professional and technical employees as soon as possible after entry on the job.

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Harry P Kramer

Director,
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## The National Air Pollution Manpower Development Advisory Committee

January 1, 1972

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

# Chronological Schedule 1972 • 1973 Institute for Air Pollution Training Courses

| 1972 Dates | Course Number | Course Title and Location |
|---|---|---|
| July 10-14 | 450 | Source Sampling for Air Pollutants (5 Days, Research Triangle Park, North Carolina) |
| July 11-13 | 439 | Visible Emissions Evaluation (3 Days, Orlando, Florida |
| July 17-21 | 420 | Air Pollution Microscopy (5 Days, Denver, Colorado) |
| July 24-28 | 450 | Source Sampling for Air Pollutants (5 Days, Research Triangle Park, North Carolina) |
| July 25-27 | 458 | Air Pollution Administration I (3 Days, Research Triangle Park, North Carolina) |
| July 25-27 | 444 | Air Pollution Field Enforcement (3 Days, Cincinnati, Ohio) |
| August 7-11 | 450 | Source Sampling for Air Pollutants (5 Days, Research Triangle Park, North Carolina) |
| August 8-10 | 459 | Air Pollution Administration II (3 Days, Research Triangle Park, North Carolina) |
| August 7-18 | 452 | Principles and Practice of Air Pollution Control (Basic 10-Day course, Research Triangle Park, N. C.) |
| August 8-10 | 439 | Visible Emissions Evaluation (3 Days, State College, Pennsylvania) |
| August 21-25 | 435 | Atmospheric Sampling (5 Days, San Juan, Puerto Rico) |
| August 21-25 | 431 | Air Pollution Control Technology (5 Days, Boston, Massachusetts) |
| August 21-25 | 454 | Environmental Training Simulations (5 Days, Research Triangle Park, North Carolina) |
| August 21-29 | 440 | Special Topics in Air Quality Management (7 Days Research Triangle Park, North Carolina) |
| August 22-24 | 439 | Visible Emissions Evaluation (3 Days, Cincinnati, Ohio |
| August 28-September 1 | 431 | Air Pollution Control Technology (5 Days, Research Triangle Park, North Carolina) |
| September 5-7 | 444 | Air Pollution Field Enforcement (3 Days, Research Triangle Park, North Carolina) |
| September 5-7 | 439 | Visible Emissions Evaluation (3 Days, Research Triangle Park, North Carolina) |
| September 6-8 | 460 | Air Pollution Administration III (3 Days, Research Triangle Park, North Carolina) |
| September 11-15 | 450 | Source Sampling for Air Pollutants (5 Days, Research Triangle Park, North Carolina) |
| September 11-15 | 415 | Control of Gaseous Emissions (5 Days, Seattle, Washington) |
| September 11-22 | 452 | Principles and Practice of Air Pollution Control (Basic 10-Day course, Research Triangle Park, N. C.) |

Courses 413 and 415 are now scheduled sequentially in a two-week block.

| 1972 Dates | Course Number | Course Title and Location |
|---|---|---|
| September 11-22 | 464 | Analytical Methods for Air Quality Standards (10 Days, Research Triangle Park, North Carolina) |
| September 12-14 | 439 | Visible Emissions Evaluation (3 Days, Edison, New Jersey) |
| September 18-22 | 431 | Air Pollution Control Technology (5 Days, Dallas, Texas) |
| September 18-22 | 413 | Control of Particulate Emissions (5 Days, Seattle, Washington) |
| September 19-21 | 444 | Air Pollution Field Enforcement (3 Days, Kansas City, Missouri) |
| September 25-October 6 | 464 | Analytical Methods for Air Quality Standards (10 Days, Research Triangle Park, North Carolina) |
| September 25-29 | 423 | Diffusion of Air Pollution – Theory and Application (5 Days, Research Triangle Park, N. C.) |
| September 26-28 | 444 | Air Pollution Field Enforcement (3 Days, Seattle, Washington) |
| October 2-6 | 450 | Source Sampling for Air Pollutants (5 Days, Research Triangle Park, North Carolina) |
| October 2-6 | 431 | Air Pollution Control Technology (5 Days, Albany, New York) |
| October 2-4 | 455 | Air Pollution Principles for Planners (3 Days, San Francisco, California) |
| October 4-6 | 456 | Regional Planning for Air Pollution Control Officers (3 Days, San Francisco, California) |
| October 10-12 | 439 | Visible Emissions Evaluation (3 Days, Research Triangle Park, North Carolina) |
| October 10-12 | 444 | Air Pollution Field Enforcement (3 Days, San Francisco, California) |
| October 10-20 | 452 | Principles and Practice of Air Pollution Control (Basic 10-Day course, Research Triangle Park, N.C.) |
| October 16-18 | 465 | Determination of Polycyclic Aromatic Hydrocarbons (3 Days, Research Triangle Park, N.C.) |
| October 16-20 | 450 | Source Sampling for Air Pollutants (5 Days, Research Triangle Park, North Carolina) |
| October 16-20 | 431 | Air Pollution Control Technology (5 Days, Atlanta, Georgia) |
| October 17-19 | 439 | Visible Emissions Evaluation (3 Days, Research Triangle Park, North Carolina) |
| October 23-November 3 | 436 | Measurement of Atmospheric Metals (10 Days, Research Triangle Park, North Carolina) |
| October 25-27 | 457 | Air Pollution Workshop in Public Communications (3 Days, Research Triangle Park, N.C.) |
| October 30-November 1 | 455 | Air Pollution Principles for Planners (3 Days, Boston, Massachusetts) |
| October 30-November 3 | 411 | Air Pollution Meteor Boston, Massachuset |
| October 30-November 3 | 450 | Source Sampling for Triangle Park, North |
| October 31-November 2 | 444 | Air Pollution Field E Illinois) |
| November 1-3 | 456 | Regional Planning fo (3 Days, Boston, Mas |
| November 6-10 | 420 | Air Pollution Microsc California) |
| November 6-17 | 436 | Measurement of Atm Research Triangle Pa |
| November 6-17 | 452 | Principles and Practic (Basic 10-Day course |
| November 7-9 | 439 | Visible Emissions Eva Triangle Park, North |
| November 13-17 | 450 | Source Sampling for Triangle Park, North |
| November 20-21 | 462 | Air Pollution Agency Research Triangle Par |
| November 27-December 1 | 435 | Atmospheric Samplin |
| November 27-December 1 | 415 | Control of Gaseous E Denver, Colorado) |
| November 27-December 1 | 461 | Air Pollution Systems Triangle Park, North |
| December 4-8 | 411 | Air Pollution Meteoro Park, North Carolina) |
| December 4-8 | 413 | Control of Particulate Denver, Colorado) |
| December 5-7 | 444 | Air Pollution Field E (3 Days, Dallas, Texas |
| December 11-15 | 463 | Air Quality Monitorin Triangle Park, North |
| December 11-15 | 431 | Air Pollution Control Cincinnati, Ohio) |

Courses 413 and 415
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**e Title and Location**

ytical Methods for Air Quality Standards (10 Days,
rch Triangle Park, North Carolina)
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le Park, North Carolina)
llution Workshop in Public Communications
s, Research Triangle Park, N.C.)
llution Principles for Planners (3 Days, Boston,
husetts)

| | **Course Number** | **Course Title and Location** |
|---|---|---|
| October 30-November 3 | 411 | Air Pollution Meteorology (5 Days, Boston, Massachusetts) |
| October 30-November 3 | 450 | Source Sampling for Air Pollutants (5 Days, Research Triangle Park, North Carolina) |
| October 31-November 2 | 444 | Air Pollution Field Enforcement (3 Days, Chicago, Illinois) |
| November 1-3 | 456 | Regional Planning for Air Pollution Control Officers (3 Days, Boston, Massachusetts) |
| November 6-10 | 420 | Air Pollution Microscopy (5 Days, San Francisco, California) |
| November 6-17 | 436 | Measurement of Atmospheric Metals (10 Days, Research Triangle Park, North Carolina) |
| November 6-17 | 452 | Principles and Practice of Air Pollution Control (Basic 10-Day course, Research Triangle Park, N.C.) |
| November 7-9 | 439 | Visible Emissions Evaluation (3 Days, Research Triangle Park, North Carolina) |
| November 13-17 | 450 | Source Sampling for Air Pollutants (5 Days, Research Triangle Park, North Carolina) |
| November 20-21 | 462 | Air Pollution Agency Planning Seminar (2 Days, Research Triangle Park, North Carolina) |
| November 27-December 1 | 435 | Atmospheric Sampling (5 Days, Dallas, Texas) |
| November 27-December 1 | 415 | Control of Gaseous Emissions (5 Days, Denver, Colorado) |
| November 27-December 1 | 461 | Air Pollution Systems Management (5 Days, Research Triangle Park, North Carolina) |
| December 4-8 | 411 | Air Pollution Meteorology (5 Days, Research Triangle Park, North Carolina) |
| December 4-8 | 413 | Control of Particulate Emissions (5 Days, Denver, Colorado) |
| December 5-7 | 444 | Air Pollution Field Enforcement (3 Days, Dallas, Texas) |
| December 11-15 | 463 | Air Quality Monitoring Systems (5 Days, Research Triangle Park, North Carolina) |
| December 11-15 | 431 | Air Pollution Control Technology (5 Days, Cincinnati, Ohio) |

Courses 413 and 415 are now scheduled sequentially in a two-week block.

| 1973 Dates | Course Number | Course Title and Location |
|---|---|---|
| January 8-12 | 435 | Atmospheric Sampling (5 Days, Cincinnati, Ohio) |
| January 8-12 | 450 | Source Sampling for Air Pollutants (5 Days, Research Triangle Park, North Carolina) |
| January 8-12 | 415 | Control of Gaseous Emissions (5 Days, Dallas, Texas) |
| January 8-19 | 452 | Principles and Practice of Air Pollution Control (Basic 10-Day course, Research Triangle Park, N.C.) |
| January 9-11 | 458 | Air Pollution Administration I (3 Days, Philadelphia, Pennsylvania) |
| January 15-19 | 413 | Control of Particulate Emissions (5 Days, Dallas, Texas) |
| January 22-26 | 420 | Air Pollution Microscopy (5 Days, Research Triangle Park, N.C.) |
| January 22-26 | 411 | Air Pollution Meteorology (5 Days, Research Triangle Park, North Carolina) |
| January 22-26 | 454 | Environmental Training Simulations (5 Days, Los Angeles, California) |
| January 23-25 | 439 | Visible Emissions Evaluation (3 Days, Sacramento, California) |
| January 29-31 | 455 | Air Pollution Principles for Planners, (3 Days, Dallas, Texas) |
| January 29-February 2 | 450 | Source Sampling for Air Pollutants (5 Days, Research Triangle Park, North Carolina) |
| January 29-February 9 | 464 | Analytical Methods for Air Quality Standards (10 Days, Research Triangle Park, North Carolina) |
| January 31-February 2 | 456 | Regional Planning for Air Pollution Control Officers (3 Days, Dallas, Texas) |
| February 5-9 | 415 | Control of Gaseous Emissions (5 Days, Research Triangle Park, North Carolina) |
| February 6-8 | 439 | Visible Emissions Evaluation (3 Days, Research Triangle Park, North Carolina) |
| February 12-16 | 413 | Control of Particulate Emissions (5 Days, Research Triangle Park, North Carolina) |
| February 12-23 | 464 | Analytical Methods for Air Quality Standards (10 Days, Research Triangle Park, North Carolina) |
| February 12-23 | 452 | Principles and Practice of Air Pollution Control (Basic 10-Day course, Research Triangle Park, N.C.) |
| February 26-March 2 | 450 | Source Sampling for Air Pollutants (5 Days, Research Triangle Park, North Carolina) |
| February 26-March 6 | 440 | Special Topics in Air Quality Management (7 Days, Research Triangle Park, North Carolina) |

| 1973 Dates | Course Number | Course T |
|---|---|---|
| February 27-March 1 | 459 | Air Pollu Triangle |
| February 27-March 1 | 439 | Visible Georgia) |
| March 5-9 | 411 | Air Pollu Park, No |
| March 5-9 | 435 | Atmosph |
| March 5-9 | 415 | Control c |
| March 12-23 | 452 | Principle (Basic 10 |
| March 12-16 | 413 | Control c Georgia) |
| March 13-15 | 439 | Visible E Missouri) |
| March 14-16 | 460 | Air Pollu Triangle |
| March 19-21 | 465 | Determin (3 Days, |
| March 26-30 | 411 | Air Pollu Park, Nor |
| March 26-30 | 450 | Source Sa Triangle |
| March 27-29 | 444 | Air Pollu Colorado |
| April 2-4 | 455 | Air Pollu Denver, C |
| April 2-6 | 435 | Atmosphe |
| April 3-5 | 439 | Visible En Triangle |
| April 4-6 | 456 | Regional (3 Days, |
| April 9-13 | 427 | Combusti |
| April 9-20 | 452 | Principles (Basic 10- |
| April 16-20 | 405 | Sampling Allergens |
| April 17-19 | 439 | Visible En Massachus |
| April 23-26 | 461 | Air Pollut Philadelph |

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le Park, North Carolina)

| 1973 Dates | Course Number | Course Title and Location |
|---|---|---|
| February 27-March 1 | 459 | Air Pollution Administration II (3 Days, Research Triangle Park, North Carolina) |
| February 27-March 1 | 439 | Visible Emissions Evaluation (3 Days, Atlanta, Georgia) |
| March 5-9 | 411 | Air Pollution Meteorology (5 Days, Research Triangle Park, North Carolina) |
| March 5-9 | 435 | Atmospheric Sampling (5 Days, Kansas City, Missouri) |
| March 5-9 | 415 | Control of Gaseous Emissions (5 Days, Atlanta, Georgia) |
| March 12-23 | 452 | Principles and Practice of Air Pollution Control (Basic 10-Day course, Research Triangle Park, N.C.) |
| March 12-16 | 413 | Control of Particulate Emissions (5 Days, Atlanta, Georgia) |
| March 13-15 | 439 | Visible Emissions Evaluation (3 Days, Kansas City, Missouri) |
| March 14-16 | 460 | Air Pollution Administration III (3 Days, Research Triangle Park, North Carolina) |
| March 19-21 | 465 | Determination of Polycyclic Aromatic Hydrocarbons (3 Days, Research Triangle Park, N.C.) |
| March 26-30 | 411 | Air Pollution Meteorology (5 Days, Research Triangle Park, North Carolina) |
| March 26-30 | 450 | Source Sampling for Air Pollutants (5 Days, Research Triangle Park, North Carolina) |
| March 27-29 | 444 | Air Pollution Field Enforcement (3 Days, Denver, Colorado) |
| April 2-4 | 455 | Air Pollution Principles for Planners (3 Days, Denver, Colorado) |
| April 2-6 | 435 | Atmospheric Sampling (5 Days, Seattle, Washington) |
| April 3-5 | 439 | Visible Emissions Evaluation (3 Days, Research Triangle Park, North Carolina) |
| April 4-6 | 456 | Regional Planning for Air Pollution Control Officers (3 Days, Denver, Colorado) |
| April 9-13 | 427 | Combustion Evaluation (5 Days, Albany, New York) |
| April 9-20 | 452 | Principles and Practice of Air Pollution Control (Basic 10-Day course, Research Triangle Park, N.C.) |
| April 16-20 | 405 | Sampling and Analysis of Pollen and Fungus Spore Aero-Allergens (5 Days, Research Triangle Park, N.C.) |
| April 17-19 | 439 | Visible Emissions Evaluation (3 Days, Boston, Massachusetts) |
| April 23-26 | 461 | Air Pollution Systems Management (4 Days, Philadelphia, Pennsylvania) |

| 1973 Dates | Course Number | Course Title and Location |
|---|---|---|
| April 23-<br>May 4 | 464 | Analytical Methods for Air Quality Standards (10 Days, Research Triangle Park, North Carolina) |
| April 30-<br>May 2 | 455 | Air Pollution Principles for Planners (3 Days, Seattle, Washington) |
| May 2-4 | 456 | Regional Planning for Air Pollution Control Officers (3 Days, Seattle, Washington) |
| May 7-9 | 448 | Effects on Vegetation (3 Days, Research Triangle Park, North Carolina) |
| May 7-9 | 457 | Air Pollution Workshop in Public Communications (3 Days, Research Triangle Park, North Carolina) |
| May 7-11 | 415 | Control of Gaseous Emissions (5 Days, Boston, Massachusetts) |
| May 7-11 | 427 | Combustion Evaluation (5 Days, Kansas City, Missouri) |
| May 7-11 | 435 | Atmospheric Sampling (5 Days, Philadelphia, Pennsylvania) |
| May 7-18 | 452 | Principles and Practice of Air Pollution Control (Basic 10-Day course, Research Triangle Park, N.C.) |
| May 14-18 | 413 | Control of Particulate Emissions (5 Days, Boston, Massachusetts) |
| May 14-18 | 801* | Basic Environmental Statistics (5 Days, Dallas, Texas) |
| May 14-25 | 464 | Analytical Methods for Air Quality Standards (10 Days, course Research Triangle Park, North Carolina) |
| May 21-23 | 455 | Air Pollution Principles for Planners (3 Days, Research Triangle Park, North Carolina) |
| May 21-25 | 426 | Air Pollution Data Evaluation (5 Days, Dallas, Texas) |
| May 21-25 | 423 | Diffusion of Air Pollution – Theory and Application (5 Days, Research Triangle Park, N.C.) |
| May 22-24 | 458 | Air Pollution Administration I (3 Days, Albany, New York) |
| May 22-24 | 439 | Visible Emissions Evaluation (3 Days, Dallas, Texas) |
| May 30-<br>June 1 | 456 | Regional Planning for Air Pollution Control Officers (3 Days, Research Triangle Park, N.C.) |
| May 31-<br>June 1 | 462 | Air Pollution Agency Planning Seminar (2 Days, Philadelphia, Pennsylvania) |
| June 4-8 | 420 | Air Pollution Microscopy (5 Days, Edison, New Jersey) |
| June 4-8 | 413 | Control of Particulate Emissions (5 Days, Chicago, Illinois) |

| 1973 Dates | Course Number | Course Title and L |
|---|---|---|
| June 4-15 | 436 | Measurement of A<br>Research Triangle |
| June 4-15 | 452 | Principles and Pra<br>(Basic 10-Day cou |
| June 18-22 | 463 | Air Quality Monit<br>Triangle Park, Nor |
| June 18-22 | 447 | Meteorological Ins<br>(5 Days, Research |
| June 18-22 | 801* | Basic Environmen<br>Cincinnati, Ohio) |
| June 18-29 | 436 | Measurement of A<br>Research Triangle |
| June 25-29 | 426 | Statistical Evaluat<br>(5 Days, Cincinnat |
| June 25-29 | 454 | Environmental Tra<br>Research Triangle |

Courses 413 and 4
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*Office of Water
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**tle and Location**

Methods for Air Quality Standards
Research Triangle Park, North Carolina)
ion Principles for Planners (3 Days,
ashington)
Planning for Air Pollution Control Officers
eattle, Washington)
Vegetation (3 Days, Research Triangle
h Carolina)
ion Workshop in Public Communications
esearch Triangle Park, North Carolina)
Gaseous Emissions (5 Days, Boston,
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on Evaluation (5 Days, Kansas City, Missouri)
ric Sampling (5 Days, Philadelphia,
nia)
and Practice of Air Pollution Control
Day course, Research Triangle Park, N.C.)
Particulate Emissions (5 Days, Boston,
etts)
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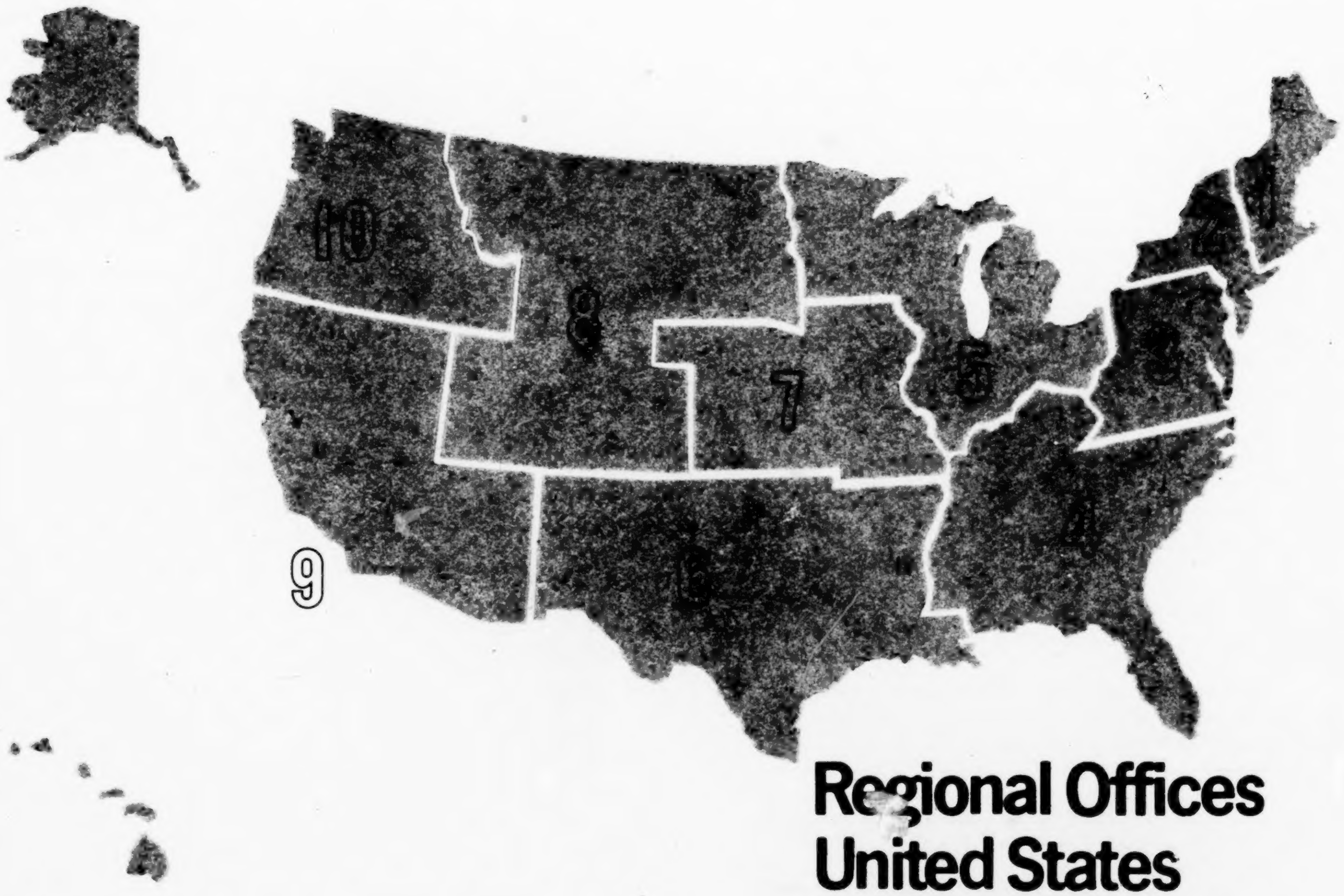
as)
Methods for Air Quality Standards
course Research Triangle Park, North Carolina)
on Principles for Planners (3 Days,
riangle Park, North Carolina)
on Data Evaluation (5 Days, Dallas, Texas)
f Air Pollution – Theory and Application
esearch Triangle Park, N.C.)
on Administration I (3 Days, Albany,

issions Evaluation (3 Days, Dallas, Texas)
anning for Air Pollution Control Officers
esearch Triangle Park, N.C.)
on Agency Planning Seminar (2 Days,
a, Pennsylvania)
on Microscopy (5 Days, Edison, New Jersey)
Particulate Emissions (5 Days,
inois)

| 1973 Dates | Course Number | Course Title and Location |
|---|---|---|
| June 4-15 | 436 | Measurement of Atmospheric Metals (10 Days, Research Triangle Park, North Carolina) |
| June 4-15 | 452 | Principles and Practice of Air Pollution Control (Basic 10-Day course, Research Triangle Park, N.C.) |
| June 18-22 | 463 | Air Quality Monitoring Systems (5 Days, Research Triangle Park, North Carolina) |
| June 18-22 | 447 | Meteorological Instrumentation in Air Pollution (5 Days, Research Triangle Park, N.C.) |
| June 18-22 | 801* | Basic Environmental Statistics (5 Days, Cincinnati, Ohio) |
| June 18-29 | 436 | Measurement of Atmospheric Metals (10 Days, Research Triangle Park, North Carolina) |
| June 25-29 | 426 | Statistical Evaluation of Air Pollution Data (5 Days, Cincinnati, Ohio) |
| June 25-29 | 454 | Environmental Training Simulations (5 Days, Research Triangle Park, North Carolina) |

Courses 413 and 415 are now scheduled sequentially in a two-week block.

*Office of Water Programs course 801 – or equivalent college training in statistics– are prerequisites for students seeking to enroll in Statistical Evaluation of Air Pollution Data course 426.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# Regional Offices
# United States
# Environmental
# Protection Agency

## Regional Administrators

1

**Region One**
Connecticut, Maine
Massachusetts, New Hampshire,
Rhode Island, Vermont
Attn: John A.S. McGlennon
John F. Kennedy Federal Building
Boston, Massachusetts 02203
Telephone: (617) 223-6883

2

**Region Two**
New York, New Jersey
Puerto Rico, Virgin Islands
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Federal Office Building
26 Federal Plaza (Foley Square)
New York, New York 10007
Telephone: (212) 264-2517

3

**Region Three**
Delaware, District of Columbia,
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West Virginia
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6th and Walnut Streets
Philadelphia, Pennsylvania 19106
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597-9431

4

**Region Four**
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Kentucky, Mississippi,
North Carolina, South Carolina,
Tennessee
Attn: Jack Ravan
Suite 300
1421 Peachtree Street
Atlanta, Georgia 30309
Telephone: (404) 526-3043

5

**Region Five**
Illinois, Indiana, Minnesota,
Ohio, Michigan, Wisconsin
Attn: Francis T. Mayo
1 North Wacker Drive
Chicago, Illinois 60606
Telephone: (312) 353-6942

6

**Region Six**
Arkansas, Louisiana,
New Mexico, Oklahoma, Texas
Attn: Arthur W. Busch
1600 Patterson Street
Dallas, Texas 75201
Telephone: (214) 749-1195

7

**Region Seven**
Iowa, Kansas, Missouri
Nebraska
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Kansas City, Missouri 64108
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8

**Region Eight**
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North Dakota, Utah, South Dakc
South Dakota, Wyoming
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916 Lincoln Towers
1860 Lincoln Street
Denver, Colorado 80203
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9

**Region Nine**
Arizona, California, Hawaii,
Nevada, Guam, American Samoa
Attn: Paul DeFalco Jr.
100 California Street
San Francisco, California 94111
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10

**Region Ten**
Alaska, Idaho, Oregon,
Washington
Attn: James L. Agee
1200 6th Avenue
Seattle, Washington 98101
Telephone: (206) 442-1200

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|---|---|---|
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| Two | – | Kenneth Johnson |
| Three | – | Stephen C. Wassersug |
| Four | – | Gene B. Welsh |
| Five | – | Robert Schneider |
| Six | – | Dean Mathews |
| Seven | – | Carl Blomgren |
| Eight | – | Charles Murray |
| Nine | – | Frank Covington |
| Ten | – | Robert Burd |

**EPA - Regional Manpower and Training Respresentatives**

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|---|---|---|
| One | – | Edgar L. Bernard |
| Two | – | Robert J. Knox |
| Three | – | James J. Kennedy |
| Four | – | Robert Roth |
| Five | – | Chester Shura |
| Six | – | Mildred Smith |
| Seven | – | John L. Coakley |
| Eight | – | Elmer Chenault |
| Nine | – | William D. Bishop |
| Ten | – | Lyman J. Nielson |

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

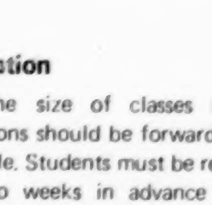
# General Information 1972 • 1973 Institute for Air Pollution Training Courses

**Eligibility Requirements**

An acceptance committee within the Manpower Development Staff evaluates course applications forwarded to the Institute for Air Pollution Training and notifies applicants whether they meet the qualifications requirements for the course or courses selected. An important consideration in evaluating eligibility is the applicant's background, experience in air pollution control, and potential for career development. The broad spectrum of courses offered by the Institute ranges from basic training designed for personnel with little or no experience to highly specialized learning modes designed to meet the needs of more sophisticated air pollution control personnel. Many courses require completion of written tests and/or study assignments by the applicant prior to course attendance.

## Registration

Since the size of classes is limited, applications should be forwarded as early as possible. Students must be registered at least two weeks in advance of course starting date in order to receive pre-course learning materials. Trainees are expected to provide for their own housing, meals, and transportation while attending courses. To provide training service to a maximum number of organizations the number of applicants from a single agency for any one course necessarily may be limited. To apply for admission to the courses presented by the Institute complete one of the application blanks inserted in this bulletin on pp. 98 to 108. A separate application form is required for each course.



## Certificates

Certificates will be awarded to those students who satisfactorily complete all course assignments and who attend all scheduled presentations (including where applicable: evening, Friday afternoon and Saturday sessions).

## Training Faculty

A full-time staff of specialists, as well as a number of adjunct faculty members, plan, develop, and conduct the courses. Lecturers and consultants who can contribute significantly from their specific knowledge and experience are drawn from Office of Air Programs personnel, other Federal, state and local agencies, universities, and industry.

## Training Objectives

The Manpower Development Staff and the Institute for Air Pollution Training offer a variety of short-term technical courses in the field of air pollution control for scientists, engineers and other professional personnel assigned responsibility in this area of environmental concern. Effective means for detailed consideration and appraisal of the newest developments in specific areas are provided, together with an opportunity for practice in the use and application of current control techniques. Visual aids, closed-circuit television, laboratory demonstrations, problem sessions and panel discussions are programmed into course presentations. Laboratory and field practice under the guidance of experts is included in the course agenda where applicable. Active participation by each trainee is mandatory.

## Technical Courses

Highly specialized, technical courses of from one to several weeks duration are conducted in the fully equipped classrooms of the Institute for Air Pollution Training, and at a number of locations throughout the country. Technical courses, usually at the postgraduate level, provide intensive training in the basic elements and methodology of air pollution control plus an opportunity for laboratory practice. In addition, several broadcoverage courses are offered for those in technical administrative positions who wish to acquire an overall perspective in specific scientific areas. Agenda for all courses are available upon request in advance of course presentations.

## Technical Seminars

The Manpower Development Staff and the faculty of the Institute for Air Pollution Training upon request will, counsel and participate in planning the presentation of technical seminars and workshops designed to meet specific needs. Symposia which provide a forum for the exchange of ideas and information, are also supported. These meetings bring together experts from throughout the United States and the world. Announcement of many such seminars, workshops, and symposia is made by publication in scientific journals. Attendance at others is restricted to an individually invited audience.

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The Institute for Air Pollution T
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of scientists and educators.

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# ir Pollution Training

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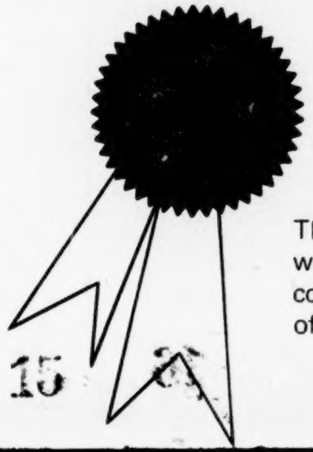

The Institute for Air Pollution Training
wishes to acknowledge the invaluable efforts and
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Columbia Laboratories
Columbus, Ohio

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Los Angeles, California

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Boyd Professor of Chemistry
Louisiana State University
Baton Rouge, Louisiana

16

# Resident Faculty Institute for Air Pollution Training

## MANPOWER DEVELOPMENT STAFF

| | |
|---|---|
| Harry P. Kramer, Director | B.S., M.S., Chemistry<br>Sc.D., Environmental Engineering |
| James B. Weigold, Assistant | B.C.E., Civil Engineering<br>M.S.C.E., Civil Engineering |

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### Administrative Office

| | |
|---|---|
| A. Vernon Flynn, | B.A., History and Political Science |

### Special Projects Branch

| | |
|---|---|
| James E. Bleadingheiser, Chief | B.S., Chemistry<br>Physics<br>Mathematics<br>Pharmacy |
| Michael J. Senew, | B.S., Mechanical Engineering<br>M.S., Industrial Administration |
| Frederick Stinson, | B.A., Mathematics<br>M.B.A., Management<br>M.S., Meteorology |
| Ronnie E. Townsend, | B.S., Physical Therapy<br>M.P.H., Chronic Disease Epidemiology |

### Institute for Air Pollution Training

| | |
|---|---|
| Francis J. King, Chief | B.S., Business Administration<br>Political Science<br>M.Ed., Administration Supervision |

### Air Quality Management Section

| | |
|---|---|
| James L. Dicke, Chief | B.A., Chemistry<br>B.S., Meteorology<br>M.S., Meteorology |
| Willis Beal | B.A., Government<br>M.R.P., City and Regional Planning |
| Alfred H. Campbell, | B.S., Biology<br>M.A., Biology |
| Imants Krese, | B.S., Civil Engineering<br>M.S., Civil Engineering |
| Charles D. Pratt, | B.S., Mathematics<br>M.P.A., Public Administration |

### Engineering and Enforcement Section

| | |
|---|---|
| William F. Todd, Chief | B.S., Chem<br>M.S., Chem |
| D. James Grove, | B.S., Chem<br>M.E., Chen |
| Dennis P. Holzschuh, | Associate c<br>Mechanical |
| Joseph E. Sickles, | B.S., Chem<br>M.S., Chem |
| Walter S. Smith, | B.S., Chem |

### Instructional Development Section

| | |
|---|---|
| George H. Ziener, Chief | B.A., Philo |
| Anne S. Rampacek, | B.M., Musi<br>M.A., Musi |
| Catherine Taylor, | B.A., Art<br>M.Ed. Edu |

### Surveillance and Laboratory Techniques Se

| | |
|---|---|
| Stanley F. Sleva, Chief | B.S., Chemi<br>M.S., Chem |
| Stanley Coloff, | B.S., Chemi<br>M.S., Chem |
| Ronald J. Drago, | B.S., Chemi |
| Edward J. Hanks, Jr., | Associate o<br>Chemical T |
| Leslie Hartman, | Associate o<br>Physical Sc |
| David R. Hicks, | |
| Karl F. Zeller, | B.S., Civil E<br>B.S., Meteo<br>M.S., Meteo |
| Karl J. Zobel, | B.S., Biolog<br>M.S., Bacte |

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| Dennis P. Holzschuh, | Associate of Science<br>Mechanical Engineering Technology |
| Joseph E. Sickles, | B.S., Chemical Engineering<br>M.S., Chemical Engineering |
| Walter S. Smith, | B.S., Chemical Engineering |

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The National Environmental Research Center at Research Triangle Park, North Carolina.

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The National Environmental
Research Center at Research Triangle
Park, North Carolina

# EPA•OAP

**The Office of Air Programs (OAP) is one part of the United States Environmental Protection Agency (EPA) . . . the operating responsibility for the Federal Program in the prevention and control of air pollution is vested with OAP.**

**The headquarters for OAP,**
located in Washington, D.C. comprises a staff dedicated to the management and administration of operational programs.

**Ten regional offices,**
located throughout the country, provide technical assistance in the establishment of environmental quality standards.

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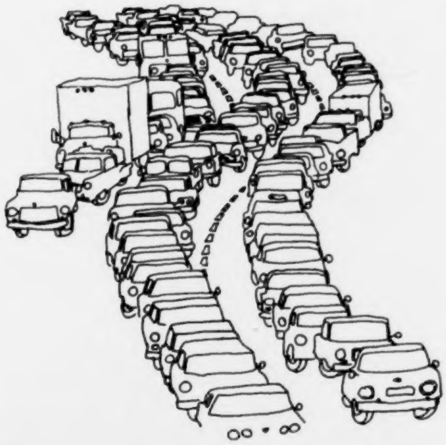
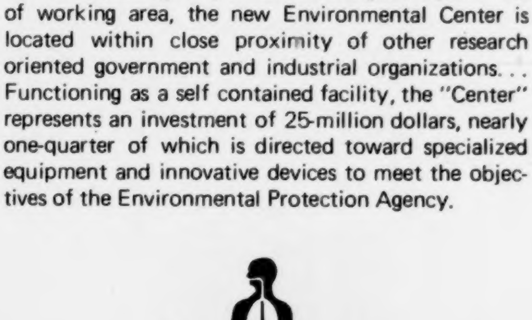


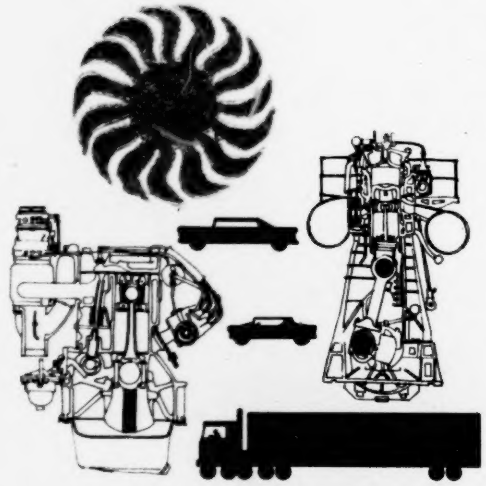
**The mobile source activities,**
of OAP located in Ann Arbor, Michigan comprise a professional staff with responsibility for the development of new technology for increased control of pollution from spark-ignited internal combustion vehicles and a development program of advanced power systems.

**The National Environmental Research Center**
located in the Research Triangle Park, North Carolina, encompasses a staff of eight hundred whose talents are directed toward research and development activities to provide the technology to regulate or prevent emissions of pollutants into the atmosphere.

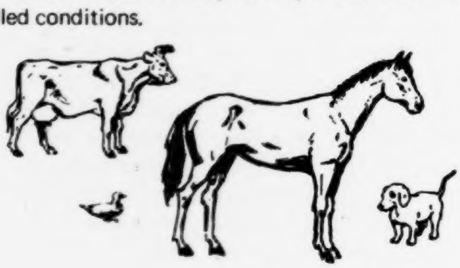
Encompassing fifty acres and 300,000 square feet of working area, the new Environmental Center is located within close proximity of other research oriented government and industrial organizations. . . Functioning as a self contained facility, the "Center" represents an investment of 25-million dollars, nearly one-quarter of which is directed toward specialized equipment and innovative devices to meet the objectives of the Environmental Protection Agency.



**Research activities**
relating to health effects will include biologic, physiologic, and toxicological studies as well as laboratory animal studies.



Irradiation chambers designed to simulate sunlight and produce a photochemical reaction in auto exhaust gas will be employed; spark-ignited and diesel engines coupled to a dynamometer unit designed to produce exhaust according to established driving patterns constitute the integrated equipment. . . . emissions proportionally diluted with clean conditioned air under regulated pressure will be fed to exposure chambers designed to house a variety of animal species for extended exposure periods under controlled conditions.



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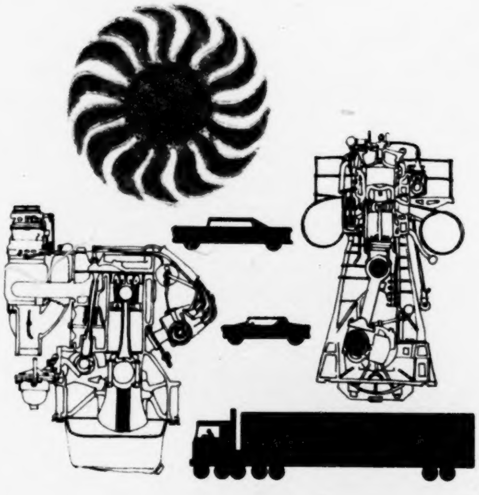

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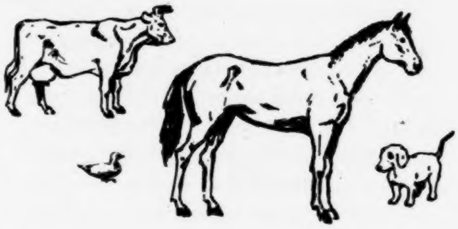
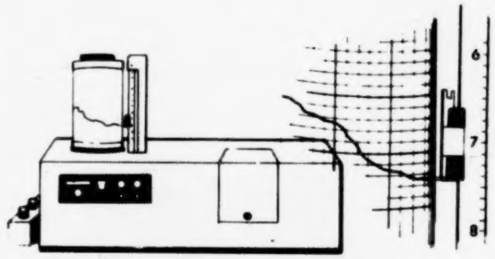
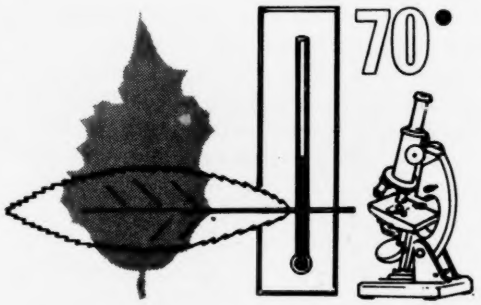
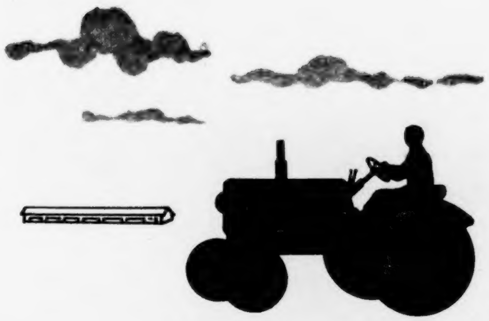




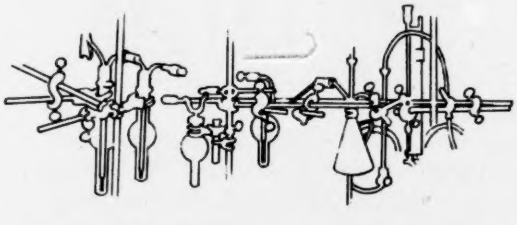
**Ancillary equipment**
includes tissue culture preparation areas, spectrophotometers for identification of organic and inorganic contaminants, liquid chromatographs for detection and measurement of higher molecular hydrocarbons. . . . particle counters, digital integrators, and gas chromatographs. . . .



**Greenhouse Facility**
will have filtered air to remove gaseous and particulate pollutants. Temperature controls of 70° F can be maintained. Plant materials grown in these greenhouses will be exposed under greenhouse, field-plot, and laboratory conditions. There will be two greenhouses, each having four compartments. In each compartment, environmental parameters can be controlled independently.



**A Field research site** of approximately twenty acres adjacent to the Technical Center will provide another valuable laboratory for agricultural research efforts. Included on this farm site will be ten acres of land to be used for extensive research plot studies and a farm equipment building to house the necessary support facilities. The Division of Meteorology will monitor all meteorological parameters in support of the agricultural research. To aid in this support there will be a 300 foot meteorological tower. The Soil Conservation Service has assumed a major role in the land development of this site. This has involved an extensive land smoothing and terracing program.



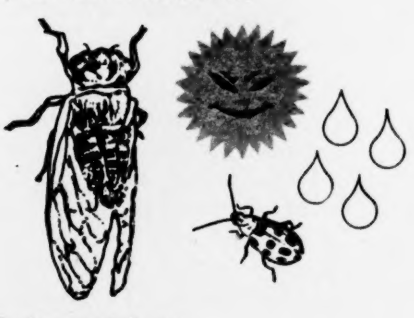
Research activities in the areas of effects of air pollutants on vegetation, plants, animals, livestock, wildlife, materials, paints, structures, metals, plastics, fabrics and dyes will be conducted on a laboratory scale.

**Two systems**
**of plant growth chambers**
**will be used:**

25 | 10

**Controlled Environment System**

Twenty-five chambers will be used for plant growth, in a pollution-free atmosphere and in a known reproducible environment. In addition, there will be 10 chambers with separate air supplies in which pollutant exposure can be controlled.



**Field Environment System**

Twenty-five plant growth chambers, through which ambient air is circulated, will be used with crops planted in the field. In some cases the ambient air pollutants are filtered out prior to the air entering the chambers and in others, pollutants are added in known amounts. Also there are cylindrical chambers, open at the top. The environmental conditions in these chambers follow the real world even more closely than the square chamber in that insects, rain, sunlight, etc., can enter the chambers directly. In these chambers, air is circulated and ambient level pollutant studies can be done or various pollutants can be added as desired.

**Exploratory research**
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**Two systems**
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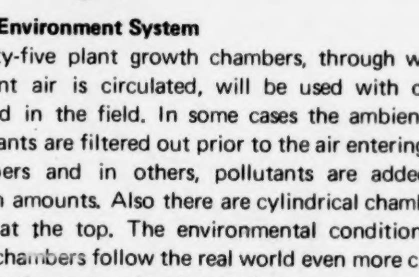

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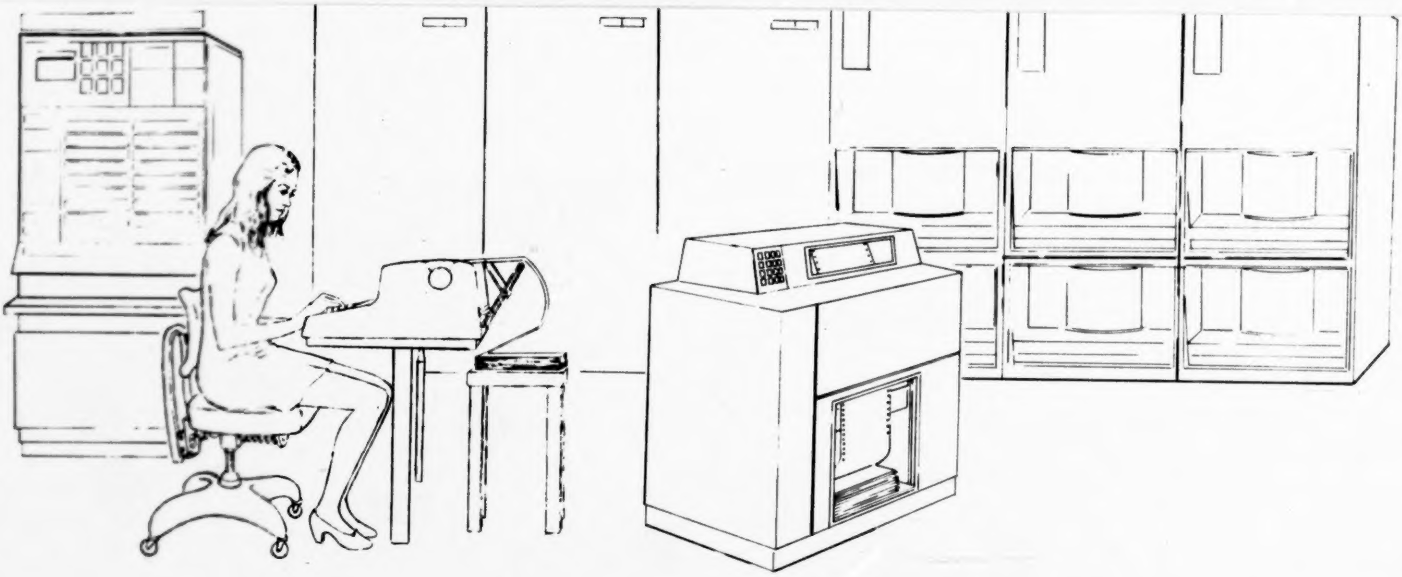
**Exploratory research**
to evaluate the feasibility of new control processes and concepts; conduct applied research related to specific processes under development. . . . continual research efforts of sampling methods and analytical procedures.



An IBM System 360 Model 50 is installed in the new Technical Center. Air quality emission data, meteorological and effects data relating to areas nationwide will constitute the national air pollution data base accessible from this central facility. Abstracts of the technical literature for the past several years are indexed on this equipment.

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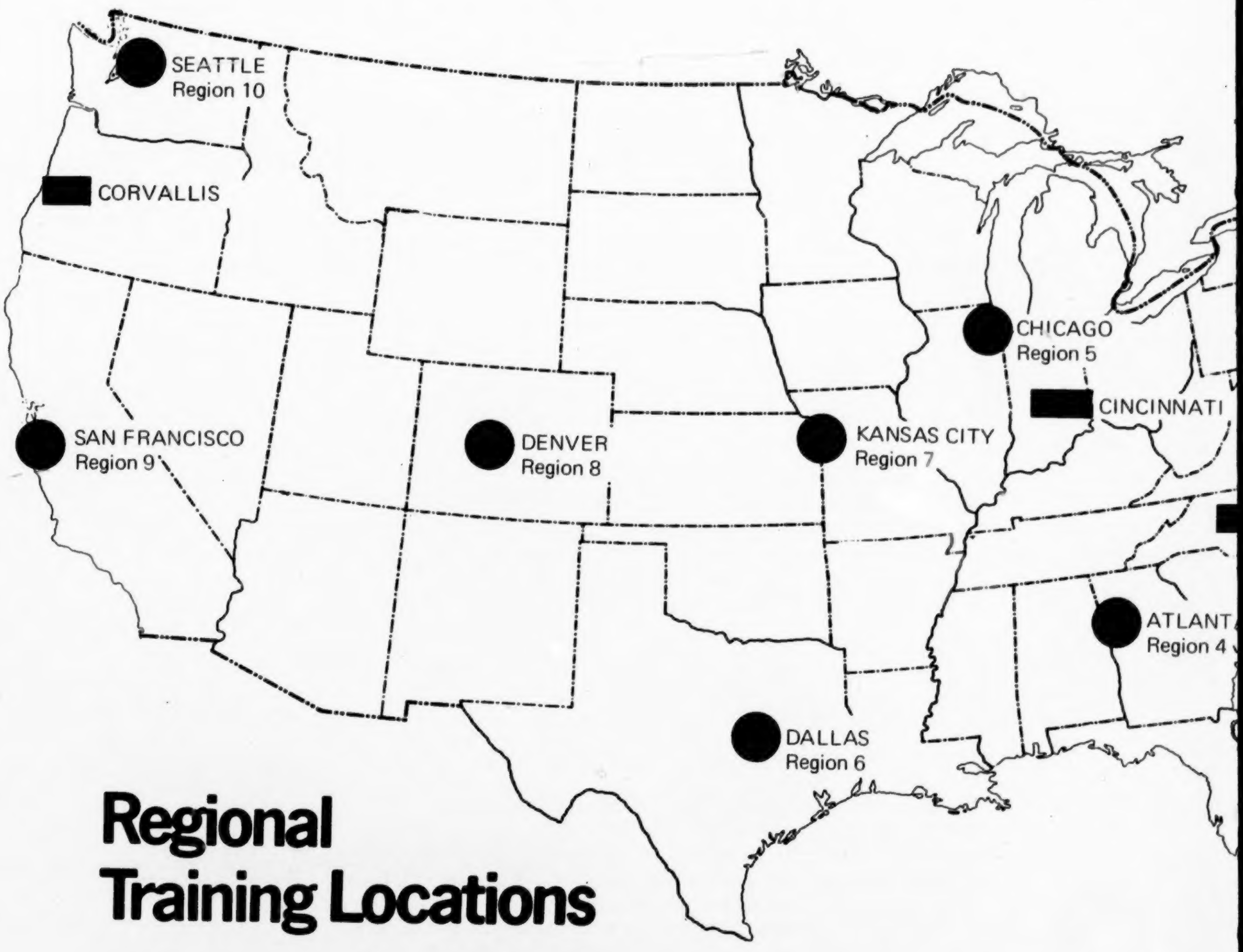
The Manpower Development Staff occupies 28,000 square feet of space in the new Environmental Research Center. Approximately 33 percent of this space is devoted to laboratories that are used by students attending courses at the Institute for Air Pollution Training. Other features include an auditorium designed to accommodate 150 to 200 people, and three classrooms with a capacity of 50 students each. The classrooms contain the capability for both a central motion picture and television projection. A self-instructional laboratory equipped with learning carrels for utilization of computer-assisted program material and for individual learning packages is also available to the students. An additional feature is a 3800 square foot television and motion picture studio and sound stage designed for the production of learning materials; the studio is supported by fully equipped film editing and processing facilities.


SEATTLE
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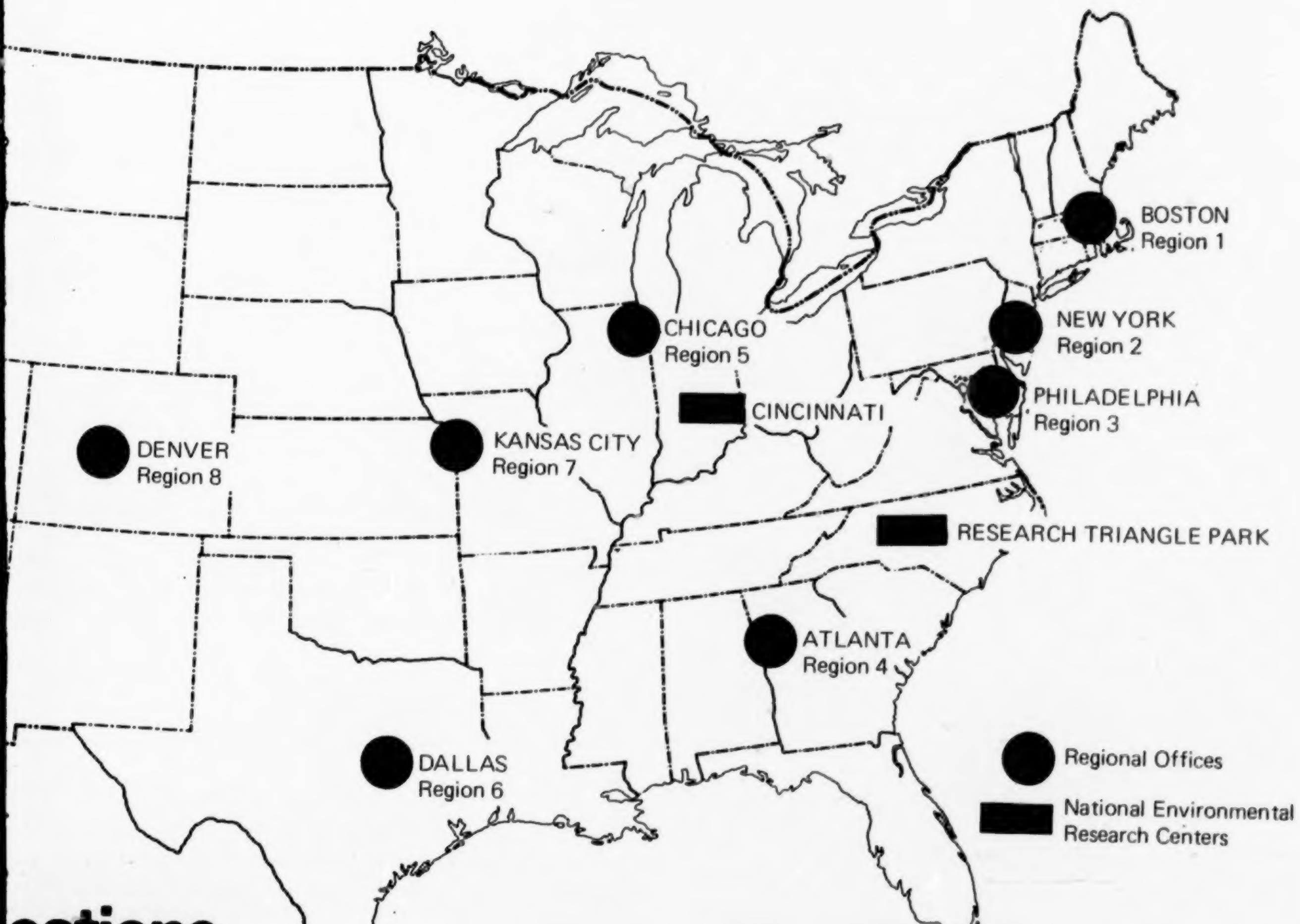
CHICAGO
Region 5
CINCINNATI
SAN FRANCISCO
Region 9
DENVER
Region 8
KANSAS CITY
Region 7
ATLANT
Region 4
DALLAS
Region 6

# Regional Training Locations

*1972-73 courses offered by the Institute for Air Pollution Training will be presented at Research Triangle Park, North Carolina and the 12 training locations pictured above.*

——————————→ *Applications for all training courses must be sent to the Registrar, Institute for Air Pollution Training, Research Triangle Park, North Carolina 27711.*


BOSTON
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NEW YORK
Region 2
PHILADELPHIA
Region 3
CHICAGO
Region 5
CINCINNATI
DENVER
Region 8
KANSAS CITY
Region 7
RESEARCH TRIANGLE PARK
ATLANTA
Region 4
DALLAS
Region 6
● Regional Offices
▬ National Environmental Research Centers

# cations

***nstitute for Air Pollution Training will be presented at Research Triangle Park, ng locations pictured above.***

***——► Applications for all training courses must be sent to the Registrar, ng, Research Triangle Park, North Carolina 27711.***

## Eligibility Requirements

**An acceptance committee within the Manpower Development Staff evaluates course applications forwarded to the Institute for Air Pollution Training and notifies applicants whether they meet the qualification requirements for the course or courses selected. An important consideration in evaluating eligibility is the applicant's background, experience in air pollution control, and potential for career development. The broad spectrum of courses offered by the Institute ranges from basic training designed for personnel with little or no experience to highly specialized learning modes designed to meet the needs of more sophisticated air pollution control personnel. Many courses require completion of written tests and/or study assignments by the applicant prior to course attendance.**

**Effective July 1, 1972 a tuition charge of 90 dollars — per day, per student — will be made for Institute for Air Pollution Training Courses. Additional information regarding fees will be furnished by the Registrar's Office.**

**To provide training service to a maximum number of organizations, the number of applicants from a single agency, for any one course, may be necessarily limited.**

**No substitution of students can be made in any course without an accompanying application form. Each student must be approved (prior to the course starting date) by the Course Director.**

**Application forms may be obtained from any EPA Regional Office.**

**Certificates will be awarded to those students who satisfactorily complete all course assignments and who attend all scheduled presentations (including where applicable: evening, Friday afternoon, and Saturday sessions).**

**Classroom enrollment limits are enforced for Institute for Air Pollution Training Courses, therefore early registration is recommended.**

**Air Quality Management Section:**
Courses 440, 452, 455, 456, 457, 458, 459, 460, 461, and 462 are limited to 36 trainees.
Course 454 is limited to 20 trainees.

**Engineering and Enforcement Section:**
Courses 413, 415, 427, 431, 439, and 444 are limited to 36 trainees.
Course 450 is limited to 24 trainees.

**Surveillance and Laboratory Techniques Section:**
Courses 405, 420, 423, 435, 436, 447 and 464 are limited to 24 trainees.
Courses 411 and 463 are limited to 36 trainees. Course 429 is limited to 18 trainees, and course 465 is limited to 20 trainees.
Course 448 is limited to 60 trainees.

Students must be registered at least two weeks in advance of course starting date in order to receive pre-course learning materials.

# 1972•1973 Course Descriptions

# SPECIAL INSTRUCTIONAL RESOURCES

A number of specialized learning resources are being utilized as part of the Institute's instructional program. Traditional printed resources such as manuals and reference materials have been expanded to include learning materials in non-print form. An individual learning laboratory has been set up wherein the student may use any of the available learning materials at his own pace, regardless of which media format is utilized. Individual learning carrells provide access to materials in all media, from video tape and computer programs to audio cassettes and filmstrips.

Every effort has been made to provide instructional materials in a format that does not require knowledge of complicated instructional hardware. Included in the resources available to the students are all of the self-instructional packages contained in courses 422-A, 422-B, and 422-C, as well as a wide variety of audio tapes, video tapes, slide packages, and related instructional materials.

Two computerized simulation programs are also available to students. One, a Strategy Effectiveness Model, allows individual students to determine the cost and effectiveness of various control equipment in a simulated community. The student in this program of study applies theoretical knowledge in a realistic situation and evaluates the results of his control strategies. The other model is an urban simulation exercise, APEX, which utilizes group interpretation in the decision-making process. This model, presently in use at more than 30 colleges and universities, provides for role-playing in the operation of a simulated urban community. This simulation provides students with two immediate and vital benefits:

1. A means is provided for working application of theoretical knowledge; the learner applies information and skills to "real-life" situations. In addition, motivation directed toward additional learning results from participation in seeking solutions to the problems.

2. A focus is provided for solving problems through an interdisciplinary approach, whereby the interrelationships between "formal" areas of study and application become evident.

Additional simulations are being developed both for direct instruction and for translation of theoretical knowledge to practical skills.

422-A

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422-B

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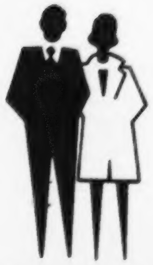
422-C

## Orientation - Level Instructional Materials

The Institute for Air Pollution Training has developed a number of instructional packages for individual student use. Federal, state, and local agencies involved in air pollution control work have received two sets of orientation-level instructional materials (courses 422-A and 422-B). Each set provides new employees, or employees with little or no air pollution control experience, with a broad understanding of air pollution—its sources, effects, and control methods.

A third set of materials (course 422-C) represents a continuing series of packages providing greater scope and depth in specific areas of air pollution control than the packages contained in courses 422-A and 422-B.

All of these materials have been prepared for individual student use with specific learning objectives listed for each package. Students may proceed at their own pace through the materials, skipping packages covering familiar material, and repeating packages in which they experience difficulty in reaching the objectives. Each package is first developed in a validation or draft form, for evaluation by subject specialists and students, in order to provide substantive revision information in both content accuracy and learning effectiveness.



# ORIENTATION COURSES

## 422-A

### Air Pollution Orientation Course

This orientation course is composed of a set of packages that represents the revised version of course 422-A, which was validated during FY 71-72. The entire content has been updated especially in the rapidly changing legal and control technology areas. The presentation format which has been revised, is based on student use. This course has been sent to air pollution control agencies at all government levels. Completion of this course or its equivalent in experience is now a requirement for the Basic 10-Day course 452. The ten media learning packages in course 422-A include nine instructional packages on cassette tape with printed support material and one evaluation package in printed form. The instructional packages are:

- Air Pollution Law
- Air Pollutants and Their Sources
- Effects of Air Pollution
- Sampling and Analysis of Air Pollutants
- Control Techniques for Gases and Particulates
- Meteorology in Air Pollution Control
- Air Pollution Control Regulations
- Air Quality Management
- Enforcement Systems

## 422-B

### Introduction to Air Pollution Cont

This introductory course, an adaptation of the original Computer-Assisted Instruction course has been put into a series of printed booklets in a programmed-instruction format. The course may now be utilized by agencies that do not have continuous access to computer terminals. The packages in this course provide users with a basic introduction to the field of air pollution control. Because each package is an independent entity, students may not only proceed at their own pace, but may also choose their own sequence of packages. This course is still in the process of valida
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- Air Pollution
- Air Pollution
- Air Pollution
- Air Pollution
- Legal Aspects
- Sources and P
- Air Pollution

## 422-C

### Special Subjects in Air Pollution Co

These materials, which are a series of independent learning packages utilizing a variety of medium formats, include audio cassette tapes, 8mm film cartridges or filmstrips, and printed support materials. Specified learning objectives, along with a method of self-evaluation, are provided as part of each package. These self-instructional materials are intended for use after courses 422-A and 422-B. They provide greater scope and depth in specific areas of air pollution control than the broad orientation materials contains in courses 422-A and 422-B. In some cases, they also form part of the required pre-course instruction for certain advanced courses listed in this bulletin. 422-C, Special Subjects
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- Laboratory Pr
- Meteorology
- Legal Aspects
- Enforcement

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# 422-B

## Introduction to Air Pollution Control

This introductory course, an adaptation of the original Computer-Assisted Instruction course has been put into a series of printed booklets in a programmed-instruction format. The course may now be utilized by agencies that do not have continuous access to computer terminals. The packages in this course provide users with a basic introduction to the field of air pollution control. Because each package is an independent entity, students may not only proceed at their own pace, but may also choose their own sequence of packages. This course is still in the process of validation, and each package will be made available to air pollution control agencies as it is completed. The packages in 422-B include:

Air Pollution Effects on Man
Air Pollution Effects on Materials
Air Pollution Effects on Vegetation
Air Pollution Meteorology
Legal Aspects of Air Pollution Control
Sources and Pollutants
Air Pollution Control Technology

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# 422-C

## Special Subjects in Air Pollution Control

These materials, which are a series of independent learning packages utilizing a variety of medium formats, include audio cassette tapes, 8mm film cartridges or filmstrips, and printed support materials. Specified learning objectives, along with a method of self-evaluation, are provided as part of each package. These self-instructional materials are intended for use after courses 422-A and 422-B. They provide greater scope and depth in specific areas of air pollution control than the broad orientation materials contains in courses 422-A and 422-B. In some cases, they also form part of the required pre-course instruction for certain advanced courses listed in this bulletin. 422-C, Special Subjects in Air Pollution Control, is not intended as a specific course, but rather as a continuing series of self-instructional packages developed to meet specific learning needs. Areas covered will include:

Laboratory Procedures
Meteorology
Legal Aspects
Enforcement

Agencies will be notified as specific packages become available and may obtain these materials to meet their in-house training needs.

# BASIC COURSE

# 10-Day Comprehensive Course in Air Pollution Control Technology

## 452

### Principles and Practice of Air Pollution Control
10 Days

***Classroom enrollment limit: 36***

Course 422-A – or equivalent experience – is a prerequisite for course 452.

The responsibility of the Federal Government's Office of Air Programs to provide leadership and assistance to state and local air pollution control agencies in the recruitment and development of qualified personnel is a major theme of the 1970 Clean Air Act.

To meet these growing manpower needs, classroom, laboratory, and field training are combined in this intensive 10-day course in air pollution control conducted by the Institute for Air Pollution Training.

This basic 10-day course provides a comprehensive introduction to the technology of air pollution control. The student receives classroom training in the principles and practice of pollution control technology, legal bases for control, meteorology, and program administration. Additional classroom training and laboratory practice develop basic skills related to sampling, plume evaluation, laboratory analyses, field studies, and data evaluation.

Emphasis is placed upon group interaction through participation in workshops, seminars and problem sessions. Participation in laboratory practice is included. Major topics include:

Management Services
Air quality standards and criteria
Administration
Public information and community relation
Development of control strategies

Technical Services
Laboratory operations
Operation of monitoring networks
Data reduction and processing
Selected analytical methods
Meteorology

Field Services (Enforcement)
Scheduled inspections
Complaint handling and investigations
Operation of field patrols
Preparation for legal actions
Emergency episode procedures
Source identification and registration

Engineering Services
Calculation of emission estimates
Operation of permit systems
Source testing
Source control regulations
Control of particulates
Control of gases

photo courtesy of Environmental Communications

# APEX
(Air Pollution Exercise)

# Simulation Exercises

The responsibility of the Federal Government's Office of Air Programs to provide leadership and assistance to State and local air pollution control agencies in the recruitment and development of qualified personnel is a major theme of the 1970 Clean Air Act. The Office of Air Programs, (OAP) in conjunction with the University of Southern California and the University of Michigan, has created and developed a simulation exercise identified as APEX (Air Pollution Exercise). This exercise establishes a dynamic atmosphere in which the trainees participate in a "real world" simulation involving a community with urban and rural problems, industrial activities, and a variety of air pollution control problems.

Current and projected uses of APEX have been developed through several of the University Consortia established in conjunction with OAP's Manpower Development Staff.

This urban simulation exercise, presently in use at more than 35 colleges and universities, provides the trainees with role playing opportunities in the operation of a simulated urban community. The use of simulation exercises for the training of air pollution control professionals offers two immediate and vital benefits:

1. A means is provided for a working application of theoretical knowledge; the learner applies information and skills to "real life" situations. In addition, motivation directed toward additional learning results from participation in seeking solutions to the problems.

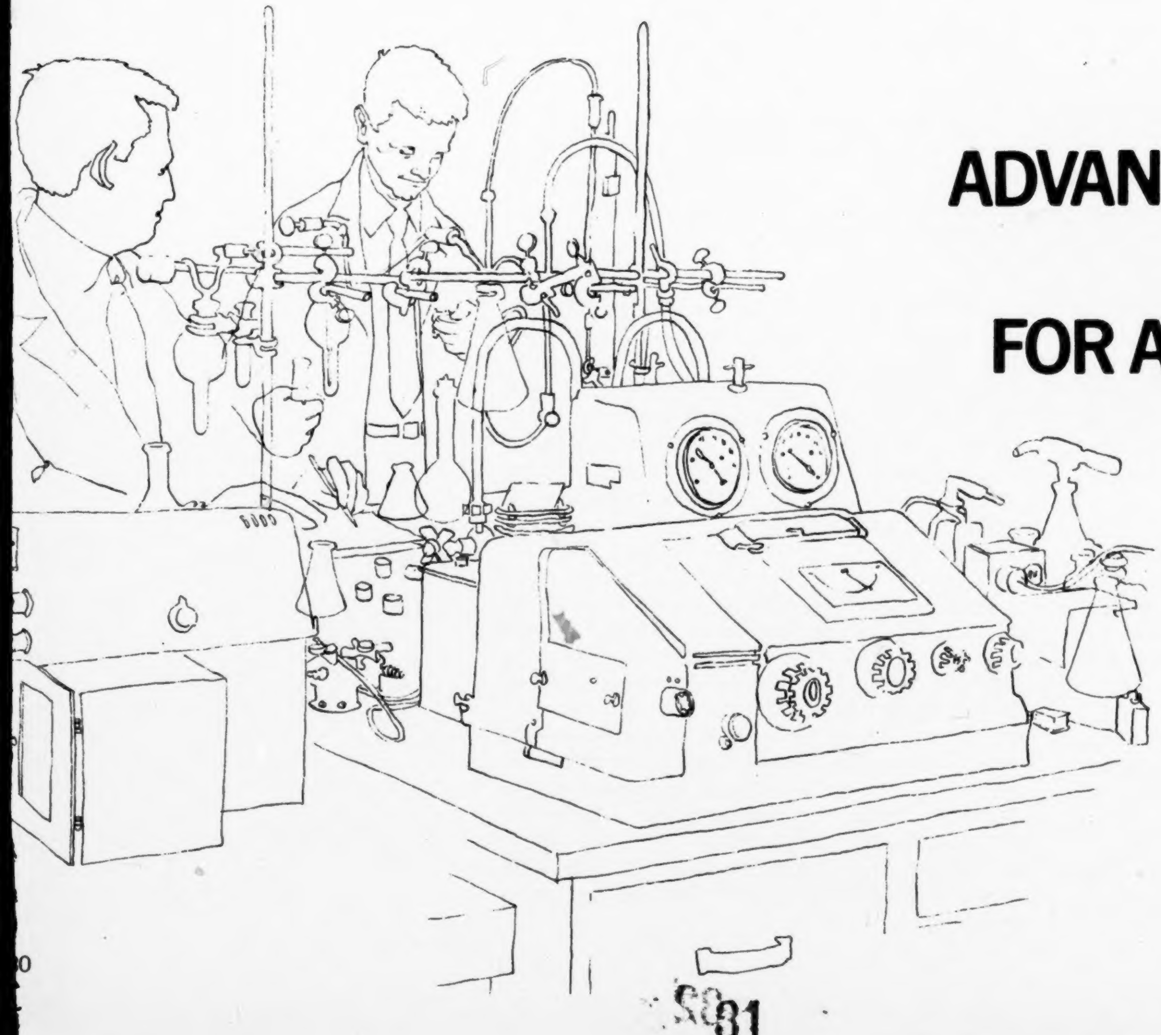
2. The focus is provided for solving problems through an interdisciplinary approach, where the interrelationship between "formal" areas of study and application becomes evident.

Students participating in APEX assume the roles of a number of decision makers: city and county politicians, city and county planners, developers, industrialists, air pollution control officers, and concerned citizens. Realistic data are supplied for each role, and the students are required to make decisions that are then analyzed by the computer. Next, the results of the decisions are presented as new situational data representing a year of "actual time". Students participating in these programs – which place special emphasis on air pollution problems – employ a wide range of skills and knowledge in a variety of areas. Additional opportunities for growth are provided through seminars, lectures, texts, and working contact with recognized authorities in a number of professions.

Within the overall format of the simulation exercise, emphasis is placed upon specific areas through the use of special situations, for example, hearings on air pollution standards or legal actions brought against a particular industry.

APEX was introduced as a graduate course at the new National Environmental Research Center in the fall of 1971 for students from the Triangle Universities Consortium. In addition to its use at the University of Southern California, APEX is now being conducted as a graduate course at the University of Illinois at Urbana and at Harvard as part of an Environmental Education program for both graduate and undergraduate studies.

Because of the flexibility of the APEX simulation exercise, the number of students trained during the past year, far exceeded the original expectations. For example, over 300 aerospace engineers and scientists in New England and California, were retrained using this urban environmental simulator. Approximately 300 university faculty, control agency personnel, industrialists, and elected officials have assumed role-playing positions in APEX programs in California, Colorado, Florida, Illinois, New York, New Jersey and Pennsylvania. During the past year over 2000 people have participated in APEX courses and special programs.



# ADVANCED COURSES
# INSTITUTE
# FOR AIR POLLUTION
# TRAINING

## 454

### Environmental Training Simulations
5 Days

***Classroom enrollment limit: 20***

This course is designed for environmental training specialists and university faculty members who wish to apply complex simulation exercises to environmental problem-solving situations.

At the conclusion of the course, the participant will be able to operate the major simulation model pre-selected by the course moderator for in-depth presentation. The model may be either APEX, Cities, or River Basin. Other exercises will include discussions of a Strategy-Effectiveness Model and several environmental impact evaluation models; the student who has special training needs may be released to devote time to these simulations. These exercises are designed to be used in EPA regional training programs and in university courses.

# Air Quality Management

## 455

### Air Pollution Principles for Planners
3 Days

***Classroom enrollment limit: 36***

This course presents those meteorological and air pollution control principles that are most relevant to contemporary urban and regional planning. No previous technical knowledge in the field of air pollution control is required. Air pollution control will be introduced to urban and regional planners in the context of workshop sessions where students will apply selected tools and techniques to practical problems. A primary course objective is to foster closer working relationships between planners and air pollution control personnel. Topics include:

Meteorology
Air pollution effects in urban areas
Air quality implementation plans
Stationary and mobile source control systems
Emission inventory methods
Pollutant source site-evaluation techniques

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Meteorology
Air pollution effects in urban areas
Air quality implementation plans
Stationary and mobile source control systems
Emission inventory methods
Pollutant source site-evaluation techniques

## 456

### Regional Planning for Air Pollution Control Officers
### 3 Days

***Classroom enrollment limit: 36***

The meteorological and planning principles that enter into comprehensive air quality management are presented in this course. No previous formal training in urban or regional planning is required; a primary course objective is to introduce regional planning concepts to air pollution control officers. Feedback is achieved through evaluation of selected case studies and discussion of current problems with Federal, state, and local air pollution control officials who will assist in conducting the course. Topics include:

Atmospheric dispersion in regional planning
Land-use planning
Transportation planning
Governmental frameworks for pollution control

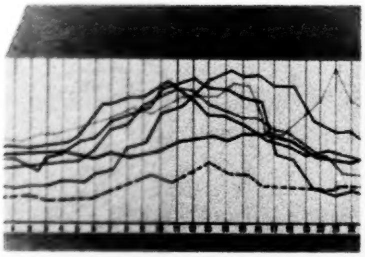
## 457

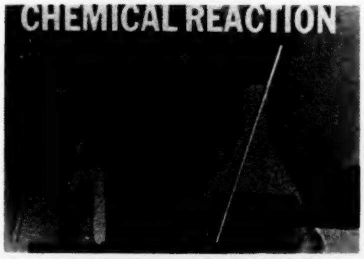
### Air Pollution Workshop in Public Communications
### 3 Days

***Classroom enrollment limit: 36***

A course in basic communications for those who have had limited experience in this field. This course is designed for air pollution control agency personnel who interface with the general public, the news media, and other agencies.

The student will receive training in techniques for preparing information releases to the public, and in methods for improving interagency communications. Federal, state, and local officials will assist in conducting the workshop. At the conclusion of the course, the student will know the necessary elements to develop a public information program and the steps involved in obtaining public support for the agency's goals.





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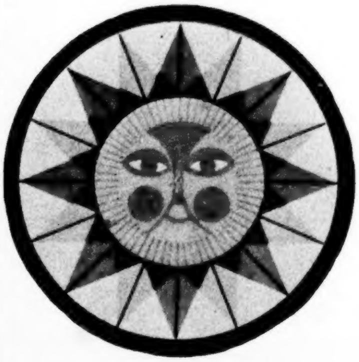


# 458

## Air Pollution Administration I
## 3 Days

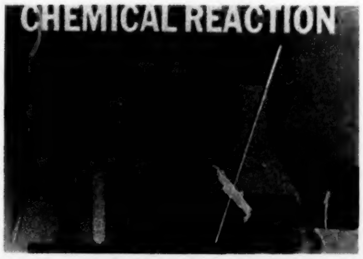
***Classroom enrollment limit: 36***

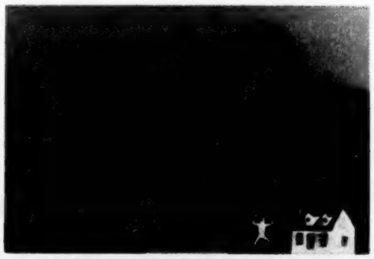
Academic training in administration is not required for this course, which is designed for air pollution control agency staff personnel charged with new responsibilities for administration operations.

Trainees attending will thoroughly review the wide range of legislation impacting upon the control agency, the functions of a comprehensive agency, and the problems of allocation of resources. Specific topics to be covered include:

Clean Air Act Amendments
Implementation plans
Elements of a comprehensive agency
Predictive model for estimating manpower requirements
Program evaluation techniques

The Air Pollution Exercise, APEX, will be used in this training course as a laboratory for the application of administrative principles and tools to selected agency problems. Federal, state, and local officials will assist in conducting the course.





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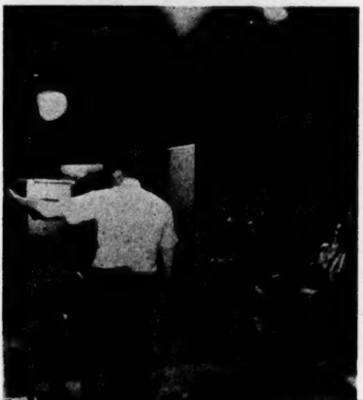

**Faculty**
**Air Quality Management Section of the**
**Institute for Air Pollution Training**

| | |
|---|---|
| James L. Dicke, Chief | B.A., Chemistry<br>B.S., Meteorology<br>M.S., Meteorology |
| Willis Beal | B.A., Government<br>M.R.P., City and Regional Planning |
| Alfred H. Campbell, | B.S., Biology<br>M.A., Biology |
| Imants Krese, | B.S., Civil Engineering<br>M.S., Civil Engineering |
| Charles D. Pratt, | B.S., Mathematics<br>M.P.A., Public Administration |

## 459

## Air Pollution Administration II
### 3 days

***Classroom enrollment limit: 36***

Prior completion of course 458, Administration I, is highly recommended.

This course is designed for mid-level supervisory personnel in an air pollution control agency who have the responsibility for establishing work requirements and work measurement techniques and for evaluating the performance of personnel in the agency.

In the course, the student will apply workload statistics techniques to the control agency's functions. He will be able to project manpower requirements as well as determine training needs for staff development. Specific topics will include:

Work elements of the comprehensive agency
Workload statistics for each element
Performance guidelines
Training programs available to state and local agencies

Federal, state, and local officials will assist in conducting this course.

## 460

## Air Pollution Administration III
### 3 Days

***Classroom enrollment limit: 36***

Completion of course 458, Administration I, or a basic understanding of agency operations is assumed.

This course is directed toward Air Pollution Control Officers and other supervisory personnel involved in program planning and resource management.

The student will learn to utilize information systems and budget control principles, and to interpret current Federal requirements for state and local program support through discussions with Federal officials assisting in the course presentation. Specific topics will include:

Review of current and proposed Federal regulations affecting agency operations
Introduction to available information systems in air pollution control
Grant and financial management under current EPA regulations

## 440

## Special Topics in Air Quality Management
### 2-5 Days

(By special arrangement upon written request)

The content of this seminar is adjusted to meet the needs of groups in specific geographical locations. Topics for discussion are carefully selected and designed to seek solution to the problem areas described by the requestors. Arrangements for this special presentation are made through a written request to the appropriate EPA Regional Office.

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## 461

### Air Pollution Systems Management
### 4 Days

***Classroom enrollment limit: 36***

Completion of course 458, Administration I, or its equivalent is recommended.

This course is designed for managers of air pollution control programs. The course provides the trainee with modern management tools for solving problems facing state and local control programs. Examples of and aids to decision-making will be related directly to the field of air pollution control agency management. Problem-solving sessions will involve application of linear programming, benefit/cost analysis, and P.E.R.T. One session is devoted to storage in and retrieval from several currently available information systems. Federal, state, and local officials will assist in conducting this course. The trainee will be required to complete pre-course materials before attending the first class session.

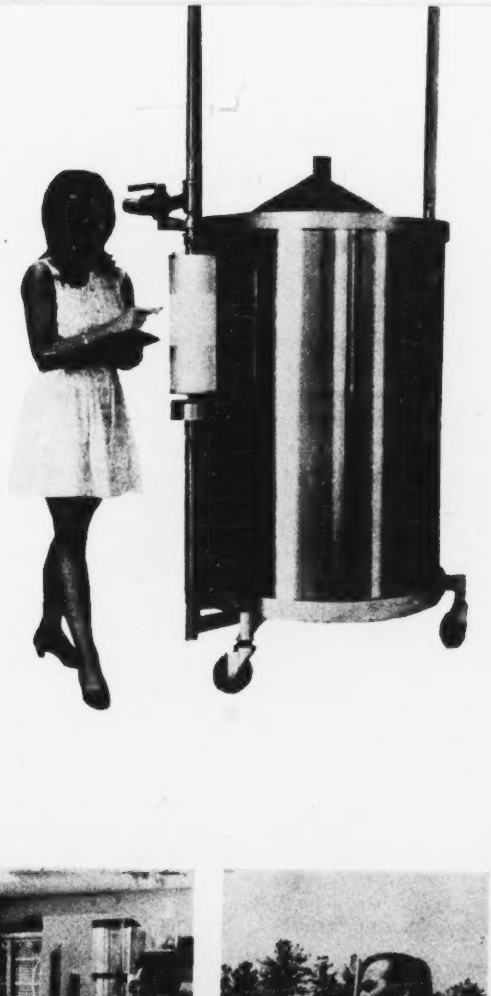
## 462

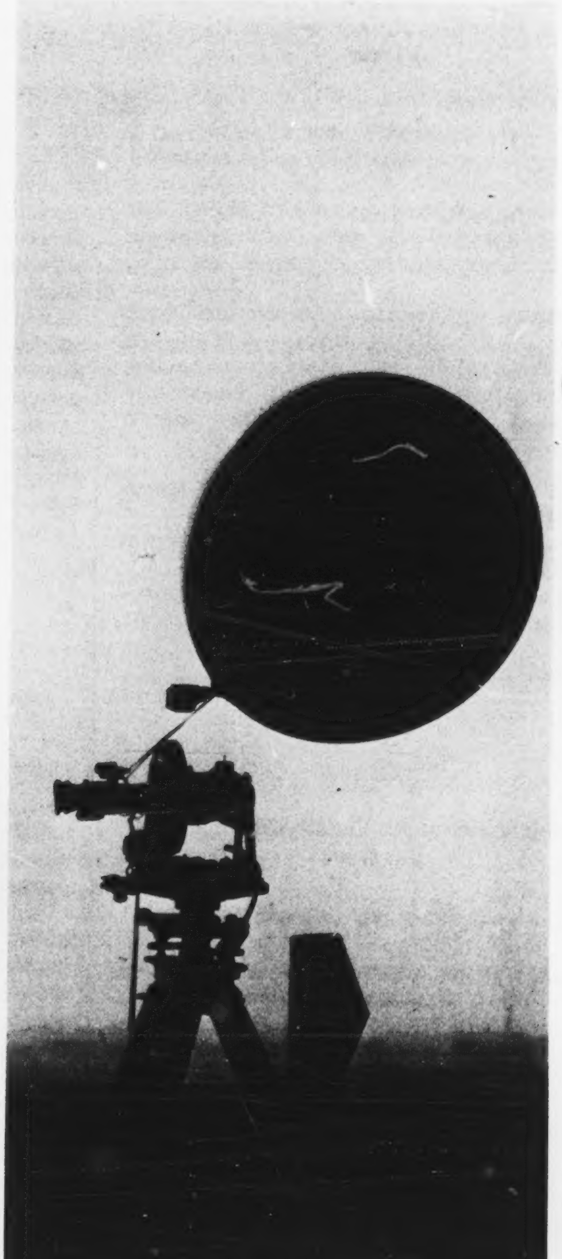
### Air Pollution Agency Planning Seminar
### 2 Days

***Classroom enrollment limit: 36***

This advanced problems course is designed for air pollution control agency planning personnel who have the responsibility for policy formulation, development of regulations, and operating procedures.

Subject matter, presented and discussed in seminar format, is structured to examine current legislation at the Federal, state, and local levels. The participants will work closely with Federal officials directly responsible for grants, enforcement, implementation plans, agency procedures, and other air pollution topics. Attendance will be primarily by invitation, and the seminar may be adapted to EPA Regional Training Centers.





## Prerequisites for Advanced Engineering courses

Courses 422-A or 422-B – or equiv
are prerequisites for courses 439, 4

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Office of Water Programs course 8
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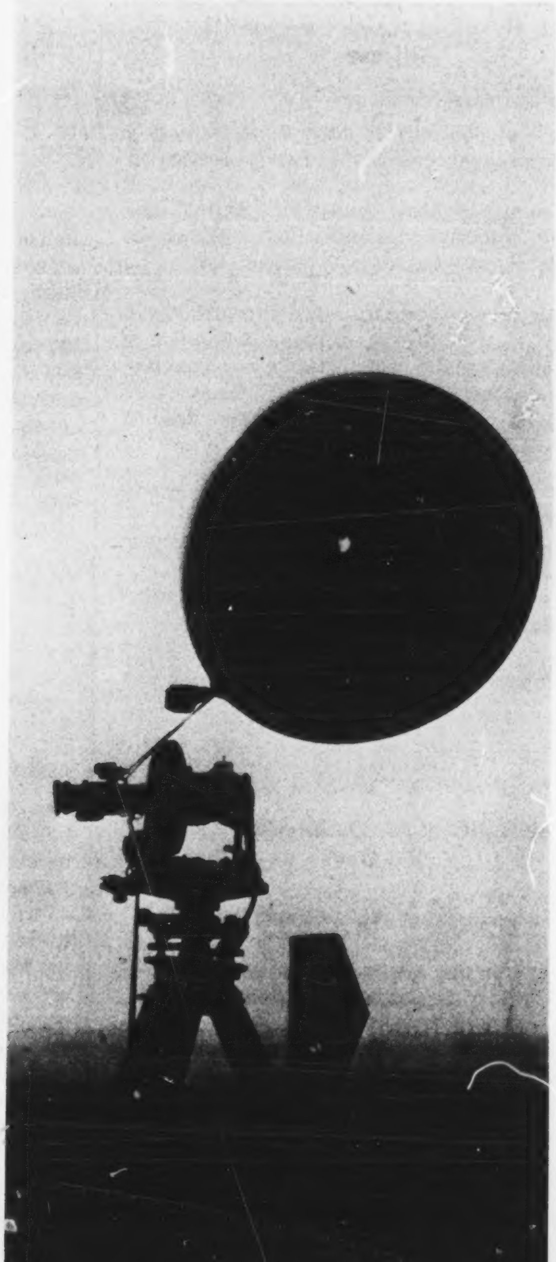

## ● Prerequisites for Advanced Engineering and Enforcement courses

Courses 422-A or 422-B – or equivalent experience – are prerequisites for courses 439, 444 and 450.

Applicants who have completed course 452 may forego courses 422-A, 422-B, 431, 439 and 444.

Office of Water Programs course 801 (Basic Environmental Statistics) or equivalent college training in statistics. In addition, enrollees are required to complete a programmed text in basic statistics, for home study, prior to reporting for course 426.

# Engineering and Enforcement

## 413

### Control of Particulate Emissions
### 5 Days

***Classroom enrollment limit: 36***

This course is designed for engineers and other technical personnel responsible for evaluating particulate collection devices. The fundamental mechanisms of collection (inertial separation, filtration, electrostatic precipitation, etc.) are discussed and the efficiency of particulate control equipment is evaluated. To achieve the goals of this course, 30 percent of the student's time is spent studying and discussing basic theory. The remaining 70 percent of this course is devoted to problem sessions which illustrate the principles involved in particulate collection. With additional information (empirical data), the knowledge gained in this course will assist the trainee in conducting plan reviews. Topics include:

Particle size technology
Control of coarse particles
Control of fine particles
Industrial applications

## 415

### Control of Gaseous Emissions
### 5 Days

***Classroom enrollment limit: 36***

This course is designed for engineers and other tec
nical personnel responsible for evaluating gaseous po
lutant control equipment. At the conclusion of th
course, the student will understand the operationa
characteristics of gaseous control equipment; and b
able (when analyzing industrial problems) to selec
appropriate gaseous pollution control equipment. I
addition this course will provide the technical know
ledge to assist the trainee in conducting plan review
of such control equipment. Major topics include:

Adsorption
Absorption
Combustion Control Equipment
Odor Control

● Courses 413 and 415 are now scheduled sequentially in a two-week block.

## 450

### Source Sampling
### 5 Days

***Classroom enrollment limit: 24***

This course is directed toward engineers and chemists who act as leaders of source stack-gas sampling teams. The training offers basic information designed to enable them to make necessary decisions, and, with further field experience, to improve their performance.

Trainees receive a comprehensive source sampling assignment, requiring them to perform a site presurvey, sampling train design, site preparation, source testing, and calculation and presentation of the results. Course topics include:

Basic theory
Source sampling fundamentals
Gas flow measurements
Collection devices and media
Analytical procedures
Design of source sampling trains
Sampling train aids
Considerations at the source
Source sampling monitors

**Faculty**
**Engineering and Enforcement Section of the Institute for Air Pollution Training**

| | |
|---|---|
| William F. Todd, | B.S., Chemistry<br>M.S., Chemical Engineering |
| D. James Grove, | B.S., Chemical Engineering<br>M.E., Chemical Engineering |
| Dennis P. Holzschuh, | Associate of Science<br>Mechanical Engineering Technology |
| Joseph E. Sickles, | B.S., Chemical Engineering<br>M.S., Chemical Engineering |
| Walter S. Smith, | B.S., Chemical Engineering |
| Peter R. Westlin, | B.S., Mechanical Engineering |

## 444

## Air Pollution Field Enforcement
## 3 Days

***Classroom enrollment limit: 36***

This course is offered to anyone who has the responsibility and authority to enforce air pollution control laws in the field: field inspectors and engineering inspectors who handle citizen complaints, investigate suspected air pollution control law violations; those who make periodic inspection of potential air pollution sources.

At the conclusion of this course, the student should be able to make an investigation in such a manner that his findings will be admissible in a court of law. He will also learn how to conduct himself so that his report and testimony will be admissible in a court of law. Topics include:

Field enforcement administration
Assembly and review of evidence
Permit systems
Odor investigation
Source registration

## 439

## Visible Emissions Evaluation
## 3 Days

***Classroom enrollment limit: 36***

This course is designed for air pollution control personnel responsible for the establishment and operation of agency-sponsored training schools involved with visible emissions evaluation.

Instruction provides the trainee with an understanding of the comparative devices and techniques used to evaluate visible emissions based upon the Ringelmann Smoke Chart (U.S. Bureau of Mines Information Circular 7718) and equivalent opacity concepts. The student will be familiar with the legal concepts of plume evaluation systems, typical code limitations currently in use, and the methods employed to certify and recertify clients in the practice of making visual ev

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# 439

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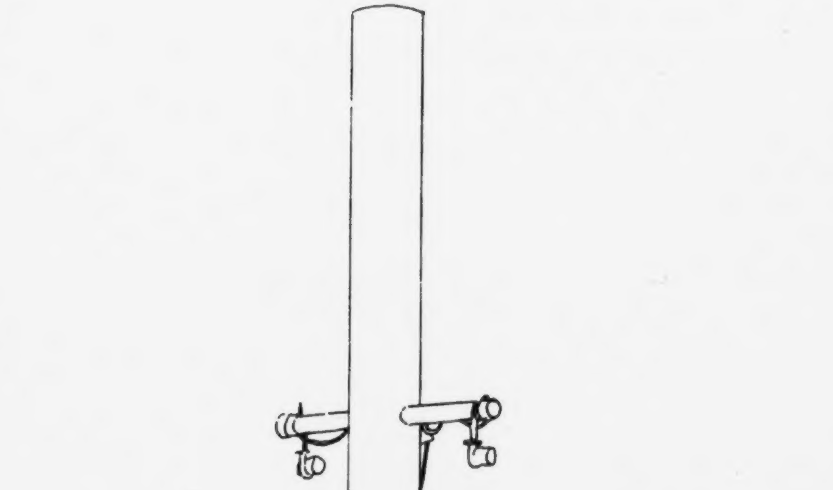
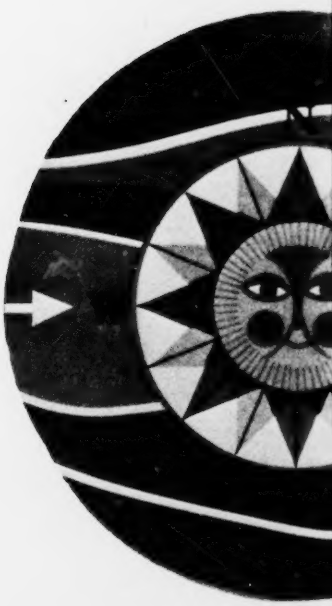
Instruction provides the trainee with an understanding of the comparative devices and techniques used to evaluate visible emissions based upon the Ringelmann Smoke Chart (U.S. Bureau of Mines Information Circular 7718) and equivalent opacity concepts. The student will be familiar with the legal concepts of plume evaluation systems, typical code limitations currently in use, and the methods employed to certify and recertify clients in the practice of making visual evaluation of plumes.

The students will also obtain a knowledge of the systems, construction components, maintenance, and operation of equipment used to train emissions evaluation personnel. Agenda items include:

Training techniques, materials, and equipment
Ringelmann and equivalent opacity systems
Plume observations method
Combustion and fossil fuels
Plume generator construction, operations,
and maintenance
Legal aspects of visible emissions evaluation





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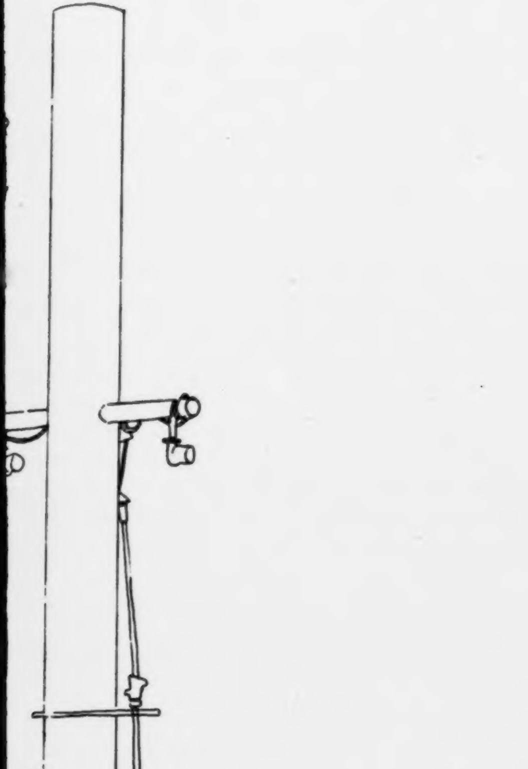

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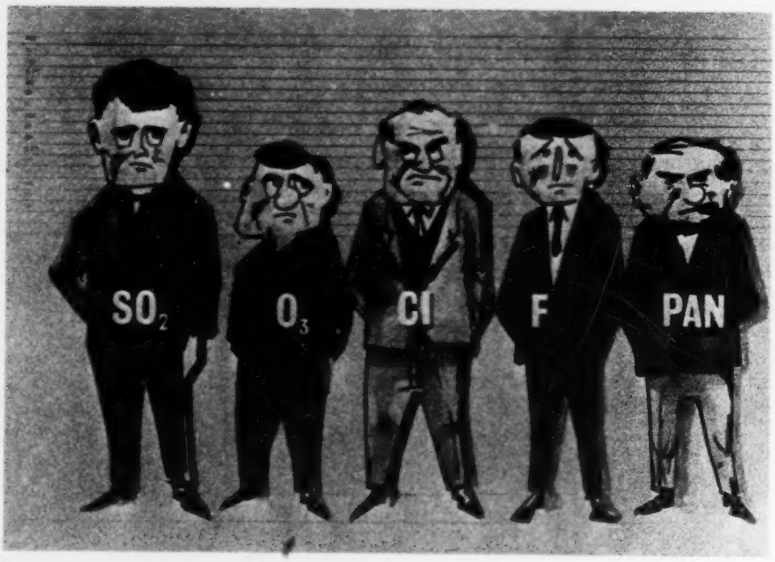
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## 431

### Air Pollution Control Technology
### 5 Days

***Classroom enrollment limit: 36***

The content of this course is designed for technical personnel who make field inspections of sources of air pollution. At the conclusion of the course the students will be familiar with the general operating principles and specific industrial application of the major particulate and gaseous air pollutant control devices. This course does not include a technical analysis of these control devices, and is suggested as a survey course prior to enrollment in courses 413, 415, and 450. Major topics include:

Control of coarse particles
Control of fine particles
Control of gaseous pollutants
Applications of control equipment

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## 441

### Special Topics in Engineering and Enforcement
### 2-5 Days

(By special arrangement upon written request)

The content of this seminar is adjusted to meet the needs of groups in specific geographical locations. Topics for discussion are carefully selected and designed to seek solution to the problem areas described by the requestors. Arrangements for this special presentation are made through a written request to the appropriate EPA Regional Office.

## 426

### Statistical Evaluation of Air Pollut
### 5 Days

Prerequisites: Office of Water Programs Course 801
(Basic Environmental Statistics) or equivalent college training in
In addition, enrollees are required to complete a programmed te
basic statistics, for home study, prior to reporting for course 42

***Classroom enrollment limit: 36***

This course is designed for professionals responsible for the collection and analysis of air pollution data. It is intended to provide the student with a thorough understanding of the concepts and application of statistics to Air Quality Studies. At the end of this course, the student should be able to apply statistical methods to his work. The lectures and problem sessions are intended to give a thorough knowledge of basic graphic and statistical techniques for reporting air pollution data. The lectures will give the student a working knowledge of statistical methods and describe some
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## 427

### Combustion Evaluation
### 5 Days

***Classroom enrollment limit: 36***

Designed for engineers and other personnel engaged in the evaluation of combustion processes. Specific emphasis is directed toward the air pollution potential of the various combustion processes covered in this course.

At the conclusion of this course the trainees will be familiar with combustion principles and fundamental calculations. Utilizing these principles, the students will be able to evaluate the air pollution potential of fossil-fuel energy sources and waste disposal incinerators.

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# 426

## Statistical Evaluation of Air Pollution Data

**5 Days**

Prerequisites: Office of Water Programs Course 801 (Basic Environmental Statistics) or equivalent college training in statistics. In addition, enrollees are required to complete a programmed text in basic statistics, for home study, prior to reporting for course 426.

***Classroom enrollment limit: 36***

This course is designed for professionals responsible for the collection and analysis of air pollution data. It is intended to provide the student with a thorough understanding of the concepts and application of statistics to Air Quality Studies. At the end of this course, the student should be able to apply statistical methods to his work. The lectures and problem sessions are intended to give a thorough knowledge of basic graphic and statistical techniques for reporting air pollution data. The lectures will give the student a working knowledge of statistical methods and describe some of the advantages and disadvantages of the methods. Major agenda topics include:

Storage and retrieval of air pollution data
Principles of data handling
Basic concepts of sampling
Experimental design and analysis
Linear regression
Time series analysis
Techniques for analyzing
special air pollution data

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# 427

## Combustion Evaluation

**5 Days**

***Classroom enrollment limit: 36***

Designed for engineers and other personnel engaged in the evaluation of combustion processes. Specific emphasis is directed toward the air pollution potential of the various combustion processes covered in this course.

At the conclusion of this course the trainees will be familiar with combustion principles and fundamental calculations. Utilizing these principles, the students will be able to evaluate the air pollution potential of fossil-fuel energy sources and waste disposal incinerators. They will also be able to evaluate the operational characteristics of combustion devices designed to reduce the emissions of air pollutants into the atmosphere. Given a critéria, the knowledge gained from the course will assist the trainees in conducting plan reviews. Major topics are:

Combustion fundamentals
Fossil-fuel burning
Burning of solid wastes

# 801

## Basic Environmental Statistics
## 5 Days

Students are required to complete a programmed home study text (approximately 40 hours) in basic statistics prior to course reporting date. Early enrollment is mandatory because the programmed text is sent to enrollees 6 weeks before the course begins. Additional study, while attending the course, includes a homework assignment every evening.

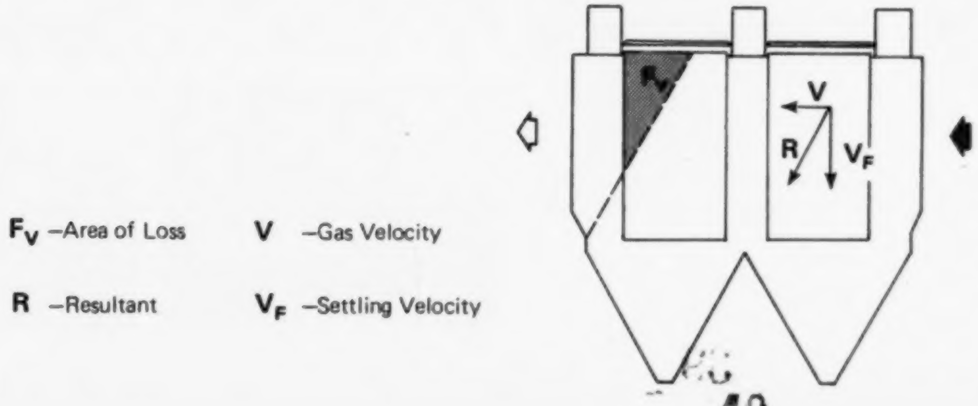
This course was designed by the Office of Water Programs to introduce the basic concepts and applications of statistics to environmentally oriented studies. The course content is designed for professional personnel responsible for the collection, analysis, and interpretation of environmental data. Emphasis is placed upon parametric tests of significance, or sampling from normally distributable data. The course is necessarily methods-oriented, and heuristic persuasion is used to furnish insights into the concepts, developments, and foundations of statistical theory.

The fundamental method of instruction utilizes a series of 30-minute TV tapes followed by discussion and problem-solving sessions. The following major topics are included, in the following sequence, in the course content:

The first six tapes furnish a detailed in-depth introduction to a test of significance.

1. The four continuous distributions (the normal, chi-square, t, and F) are introduced so that students learn how to obtain critical values from tables.
2. Point and interval estimates, plus sample size determination for the mean and standard deviation.
3. Tests of significance, plus sample size determination for the mean and standard deviation.
4. Tests of significance, plus sample size determination for mean and variability.
5. Bivariate data introduction and analysis using regression and correlation.
6. The analysis of categorical data begins with an introduction to binomial populations and continues through to a session devoted to comparing two binomial populations.

The concluding three lectures are devoted to the treatment of statistical outliers.



# 801

## Basic Environmental Statistics
## 5 Days

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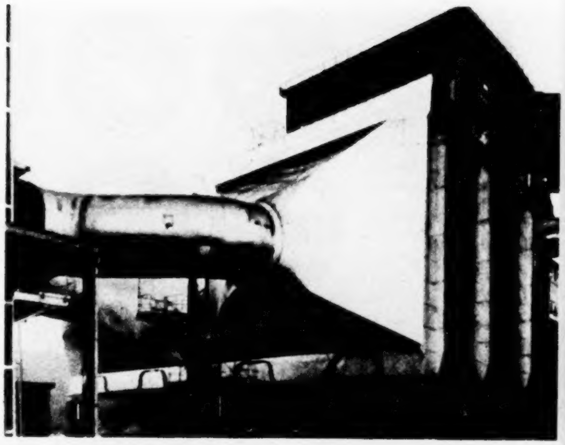
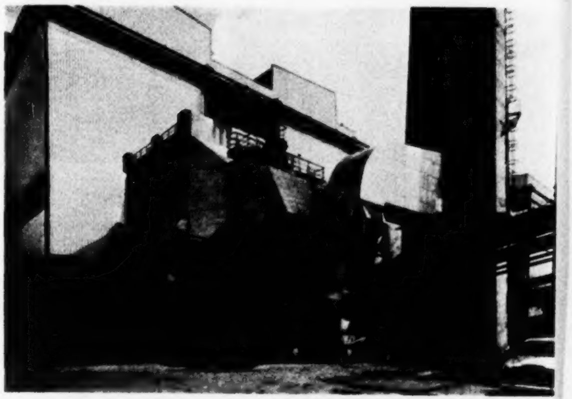
3. Tests of significance, plus sample size determination for the mean and standard deviation.
4. Tests of significance, plus sample size determination for mean and variability.
5. Bivariate data introduction and analysis using regression and correlation.
6. The analysis of categorical data begins with an introduction to binomial populations and continues through to a session devoted to comparing two binomial populations.

The concluding three lectures are devoted to the treatment of statistical outliers.

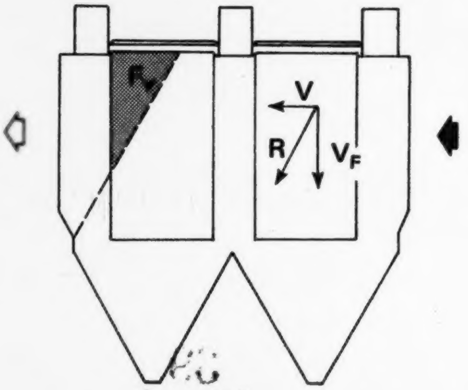


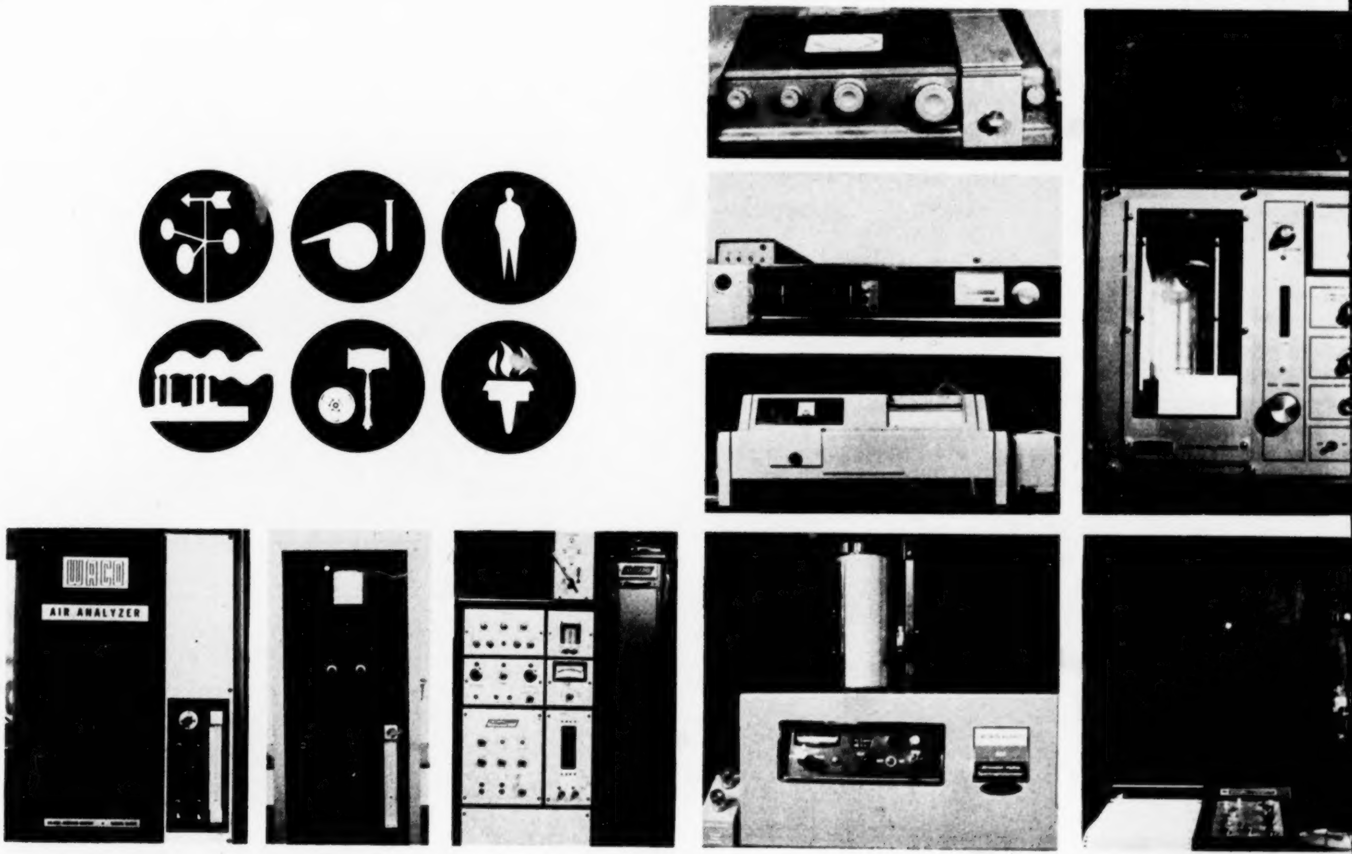
Electrostatic precipitators are important devices for controlling air pollution.

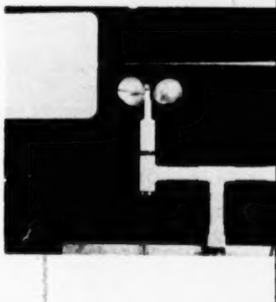


Loss $V$ —Gas Velocity

nt $V_F$ —Settling Velocity







Faculty, and trainees attending courses, at the Institute for Air Pollution Training work with an interesting variety of up-to-date laboratory instrumentation.

lty, and trainees attending courses, at the Institute for Air ution Training work with an interesting variety of up-to-date ratory instrumentation.

**Prerequisites**
**for Advanced Surveillance and Laboratory courses**

Course 411 – or equivalent experience – is a prerequisite for students seeking to register for course 423.

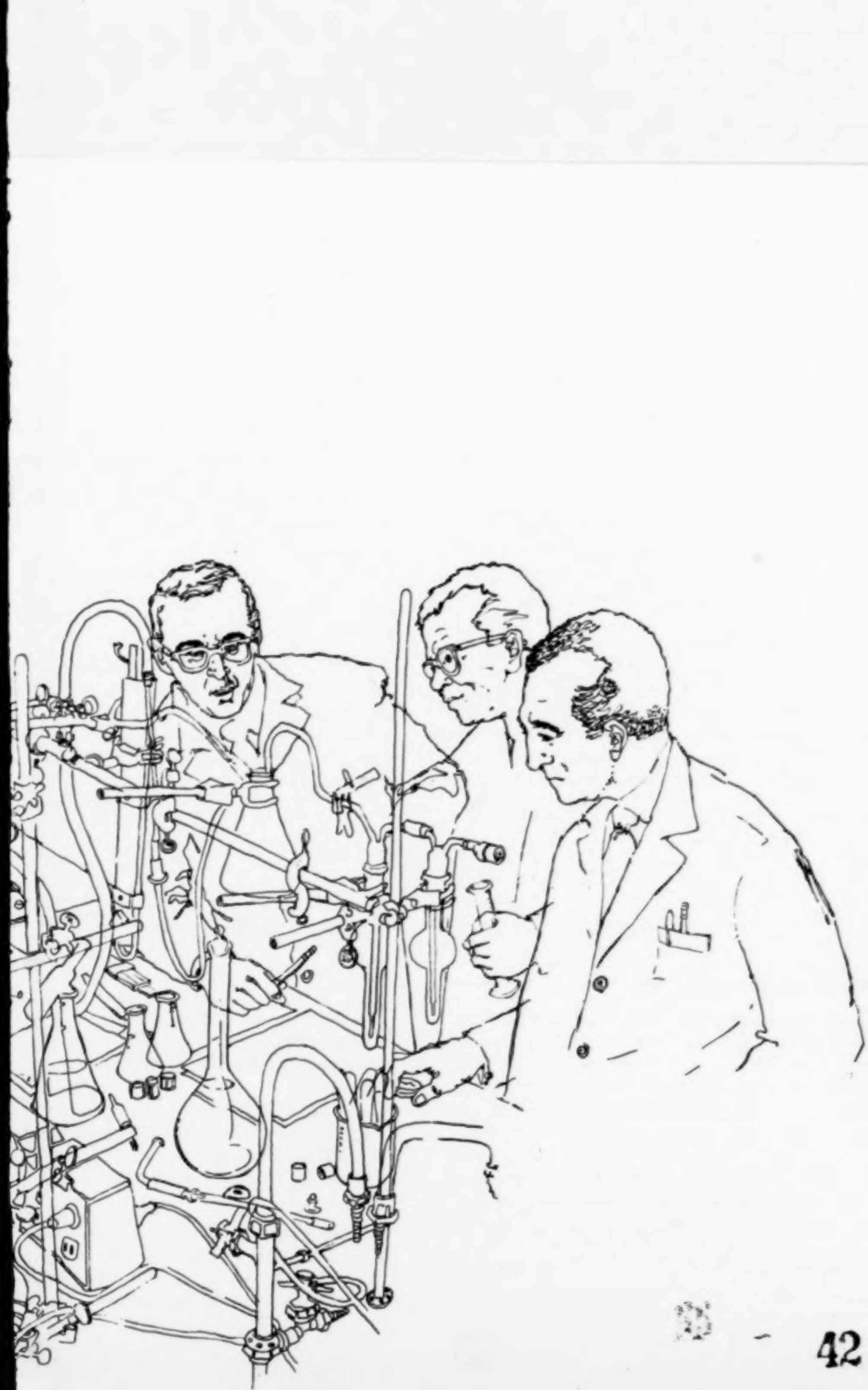
Course 411
is a prerequisite for non-meteorologists seeking to register for course 447.

Courses 422-A or 422-B – or equivalent experience – is a prerequisite for course 435.

Course 436
A fundamental knowledge of analytical chemistry is a prerequisite for this course.

Course 452 – or equivalent experience – is a prerequisite for courses 405, 420, 423, 429, 436, 438, 447 and 448.

Course 465
A fundamental knowledge of organic chemistry is a prerequisite for this course.



# Surveillance and Laboratory Techniques

**Faculty**
**Surveillance and Laboratory Techniques Section of the Institute for Air Pollution Training**

| | |
|---|---|
| Stanley F. Sleva, Chief | B.S., Chemistry<br>M.S., Chemistry |
| Stanley Coloff, | B.S., Chemistry<br>M.S., Chemistry |
| Ronald J. Drago, | B.S., Chemistry |
| Edward J. Hanks, | Associate of Science<br>Chemical Technology |
| Leslie Hartman, | Associate of Science<br>Physical Science Technology |
| David R. Hicks, | |
| Karl F. Zeller, | B.S., Civil Engineering<br>B.S., Meteorology<br>M.S., Meteorology |
| Karl J. Zobel, | B.S., Biology<br>M.S., Bacteriology |

## 442

## Special Topics in Surveillance and Laboratory Techniques

### 2-5 Days

● (By special arrangement upon written request)

The content of this seminar is adjusted to meet the needs of groups in specific geographical locations. Topics for discussion are carefully selected and designed to seek solution to the problem areas described by the requestors. Arrangements for this special presentation are made through a written request to the appropriate EPA Regional Office.

## 4

## Air Pollutio

### 5

*Classroom enrollment limit: 36*

Meteorological effects and the role they play in the transport and dispersion of air pollution are delineated in this course presentation. It is designed for engineers and physical scientists responsible for measuring air pollution levels or for measuring and evaluating meteorological parameters which affect the diffusion and concentration of pollutants in the atmosphere. Each participant calculates estimates of continuous-release pollutant concentrations and becomes familiar with meteorological instrumentation and correct instrument exposure. Discussions are held which enable the trainee to evaluate air pollution control factors related to site selection, control programming, and the planning and interpretation of surveys, as well as sources of meteorological information and

## 42

## Diffusion of Air Polluti

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*Classroom enrollment limit: 36*

This course is designed for meteorologists working in the field of air pollution who have had no formal training in atmospheric turbulence and diffusion. The course covers the development of selected theories of diffusion from the 1920's to the present, with emphasis on Pasquill's method of estimating pollutant concentrations as modified by Gifford. The application of diffusion and plume rise formulas to actual situations is discussed so that the student can evaluate the accuracy of his calculations. He learns to discuss and apply the concepts employed in several atmospheric dispersion models. He becomes familiar with turbulence instrumentation and learns data reduction techniques for use in the field.* Topics include:

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# 411

## Air Pollution Meteorology
## 5 Days

***Classroom enrollment limit: 36***

Meteorological effects and the role they play in the transport and dispersion of air pollution are delineated in this course presentation. It is designed for engineers and physical scientists responsible for measuring air pollution levels or for measuring and evaluating meteorological parameters which affect the diffusion and concentration of pollutants in the atmosphere. Each participant calculates estimates of continuous-release pollutant concentrations and becomes familiar with meteorological instrumentation and correct instrument exposure. Discussions are held which enable the trainee to evaluate air pollution control factors related to site selection, control programming, and the planning and interpretation of surveys, as well as sources of meteorological information and the availability of additional professional assistance. Problem assignments require a working knowledge of first year college mathematics. Topics include:

Meteorological fundamentals
Air pollution climatology
Meteorology and air pollution effects in urban areas
Atmospheric diffusion estimates
Effective stack height
Meteorological instruments and exposure
Analysis of air quality and meteorological data
Air pollution surveys
Air pollution potential forecasts
Meteorological models for air pollution control strategies

# 423

## Diffusion of Air Pollution — Theory and Application
## 5 Days

***Classroom enrollment limit: 36***

This course is designed for meteorologists working in the field of air pollution who have had no formal training in atmospheric turbulence and diffusion. The course covers the development of selected theories of diffusion from the 1920's to the present, with emphasis on Pasquill's method of estimating pollutant concentrations as modified by Gifford. The application of diffusion and plume rise formulas to actual situations is discussed so that the student can evaluate the accuracy of his calculations. He learns to discuss and apply the concepts employed in several atmospheric dispersion models. He becomes familiar with turbulence instrumentation and learns data reduction techniques for use in the field.* Topics include:

Statistical theory of turbulence
Diffusion equations
Estimates of pollution concentrations
Plume rise
Dispersion climatology
Turbulence instrumentation and data reduction
Dispersion modeling
Forecasting air pollution potential

Non-meteorologists requesting admission to this course should have completed Course 411 (Air Pollution Meteorology) or present evidence of similar prior training with their application.

# 447

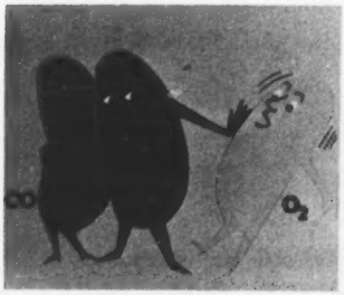
## Meteorological Instrumentation in Air Pollution
## 5 Days

***Classroom enrollment limit: 24***

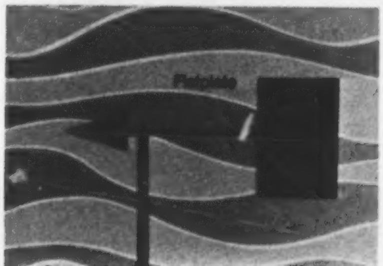
● ***For non-meteorologists, Course 411 is a prerequisite for this course.***

This course is designed for engineers and technical personnel responsible for designing, procuring and maintaining air pollution measuring instrument systems and networks that include meteorological sensors. At the conclusion of the course the trainee will understand the physical principles upon which instrumental sensing and recording of those weather elements important in air pollution are based. The student becomes acquainted with the desirable properties of a meteorological instrument system, their application and limitations with respect to specific types of measurement programs, and the evaluation of these properties by observing demonstrations and working exercises in the laboratory. The trainee becomes familiar with meteorological data reduction methods and computer programs for processing these data into tabulations and summaries. The student will also become familiar with existing air quality and meteorological instrument systems and telemetered networks. Topics include:

Characteristics of meteorological instruments
Principles of wind measuring systems
Response characteristics of wind sensors and recorders
Temperature measuring sensors for atmospheric stability
Lapse rate measuring systems
Telemetry in air pollution meteorology
Data reduction methods and computer programs for meteorological tabulations and summaries
Integrating meteorological and air quality instrumentation systems



air pollution



# 420

## Air Pollution Microscopy
## 5 Days

***Classroom enrollment limit: 24***

This course is designed for chemists, engineers and other professional personnel responsible for the identification of airborne particulates. Laboratory sessions enable the student to recognize and identify atmospheric particulates.

Instruction is designed to afford the trainee a basic understanding of the procedures required to obtain representative samples of atmospheric pollutants that are characterized by microscopic examination.

The course consists of lectures, laboratory exercises, and field exercises. The trainees obtain a knowledge of the component parts of the polarizing microscope and their functions. They are also familiarized with the special sampling and sample handling techniques used in microscopic analysis. During the laboratory sessions the trainees prepare slides. They also examine pure substances, plus samples which they have collected. Topics include:

Sampling for particulates
Optics and illumination
Polarization and the polarizing microscope
Morphology of natural particulates
Morphology of industrial dust and combustion products
Micrometry — counting and sizing
Crystal morphology
Measurement of refractive index
Dispersion staining
Photomicrography

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# 405

## Sampling and Identification of Pollen and
## 5 Days

***Classroom enrollment limit: 24***

Instruction in this course is designed to enable the trainee to discuss and use various allergen sampling equipment, to identify selected aero-allergens, and to perform calculations necessary to arrive at a quantitative assessment of the allergens present in an atmospheric sample. This course is specifically designed for professional workers concerned with the sampling and identification of atmospheric allergens.

Trainees spend approximately one-half of the course time in laboratory sessions and field exercises, which include setting up sampling equipment and

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# 436

## Measurement of Atmosph
## 10 Days

***Classroom enrollment limit: 24***

A fundamental knowledge of analytical chemistry is a prerequisite for this course.

This course is designed for chemists and other scientific personnel responsible for the qualitative and quantative determination of metals present in the atmosphere.

Students are given a working knowledge of separation and analysis techniques for metallic pollutants present in ambient air.

Eighty percent of the student's time will be spent in the laboratory separating, identifying, and measuring metallic pollutants. Major subject areas include:

Sampling for metallic compounds
Separation techniques

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# 405

## Sampling and Identification of Pollen and Fungus Spore Aero-Allergens
## 5 Days

***Classroom enrollment limit: 24***

Instruction in this course is designed to enable the trainee to discuss and use various allergen sampling equipment, to identify selected aero-allergens, and to perform calculations necessary to arrive at a quantitative assessment of the allergens present in an atmospheric sample. This course is specifically designed for professional workers concerned with the sampling and identification of atmospheric allergens.

Trainees spend approximately one-half of the course time in laboratory sessions and field exercises, which include setting up sampling equipment and collecting allergen samples. Later, in the microscopy laboratory, they identify and count the allergens in the collected samples. Topics include:

- Allergen sampling devices
- Sample preparation and handling techniques
- Human response to airborne allergens
- Dispersion and climatological effects of pollens and spores
- Counting and sizing techniques
- Biology and morphology of pollen
- Biology and morphology of fungus spores

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# 436

## Measurement of Atmospheric Metals
## 10 Days

***Classroom enrollment limit: 24***

A fundamental knowledge of analytical chemistry is a prerequisite for this course.

This course is designed for chemists and other scientific personnel responsible for the qualitative and quantative determination of metals present in the atmosphere.

Students are given a working knowledge of separation and analysis techniques for metallic pollutants present in ambient air.

Eighty percent of the student's time will be spent in the laboratory separating, identifying, and measuring metallic pollutants. Major subject areas include:

- Sampling for metallic compounds
- Separation techniques
- Analysis of:
  - Arsenic
  - Beryllium
  - Mercury
  - Cadmium
  - Manganese
  - Selenium
  - Antimony

Special Notice:

Completion of all classroom and laboratory sessions requires 10 days. However, consideration will be given to candidates who wish to forego the majority of the formal course and instead concentrate on selected segments of the seven pollutants listed above.

# 429

## Gas Chromatographic Analysis of Air Pollutants
## 10 Days

(Laboratory determinations relating to air quality standards)

***Classroom enrollment limit: 18***

Emphasis in this course is placed on the application of gas chromatography in air pollution investigations. It is designed for chemists and others responsible for the measurement of atmospheric pollution, and specifically those who have little or no experience with the technique of gas chromatographic analysis.

The course objective is to introduce the student to the basic theory of gas chromatography and develop an understanding of the operational role of the various components of a gas chromatograph, including the column, carrier gas, sample injector, detector, and recorder.

Approximately 65 percent of the student's time is spent in the laboratory, setting up and calibrating gas chromatographs and performing qualitative and quantitative analysis of unknown samples. Topics include:

Basic theory of gas chromatography
Gas chromatographic column parameters
Characteristics of the flame ionization detector
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# 435

## Atmospheric Sampling
## 5 Days

***Classroom enrollment limit: 24***

Course 422-A, or equivalent experience, is a prerequisite for course 435.

Offered to chemists, engineers, and technicians responsible for atmospheric sampling, for the primary purpose of teaching the student to select and apply sampling methods appropriate to air quality monitoring.

Approximately seventy-five percent of the course involves laboratory or work sessions in which the student will utilize the basic principles employed in atmospheric sampling. These principles consist of the calibration, location, and operation of air sampling devices. Lecture topics include:

Design of sampling systems including air movers, flow measuring devices, and collection devices.

Particulate sampling—Principles and applications:
  Deposition sampling
  Impactors and impingers
  Filtration
  Electrostatic precipitators
  Thermal precipitators

Gas sampling—Principles and applications:
  Grab sampling
  Freeze out (condensation)
  Adsorption
  Absorption
  Calibration techniques
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# 429

## Gas Chromatographic Analysis of Air Pollutants
## 10 Days

(Laboratory determinations relating to air quality standards)

the column, carrier gas, sample injector, detector, and recorder.

Approximately 65 percent of the student's time is spent in the laboratory, setting up and calibrating gas chromatographs and performing qualitative and quantitative analysis of unknown samples. Topics include:

Basic theory of gas chromatography
Gas chromatographic column parameters
Characteristics of the flame ionization detector
Characteristics of the electron capture detector
Sample handling in gas chromatography
Calculations in gas chromatography

Laboratory sessions:

Setting up and calibrating gas chromatographs
Determination of aliphatic hydrocarbons
Determination of aromatic hydrocarbons
Determination of polynuclear hydrocarbons

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# 435

## Atmospheric Sampling
## 5 Days

Design of sampling systems including air movers, flow measuring devices, and collection devices.

Particulate sampling—Principles and applications:
  Deposition sampling
  Impactors and impingers
  Filtration
  Electrostatic precipitators
  Thermal precipitators

Gas sampling—Principles and applications:
  Grab sampling
  Freeze out (condensation)
  Adsorption
  Absorption
  Calibration techniques

Air Metering devices—Applications
  and calibrations
Air movers—applications

Laboratory topics include
Calibration of the following air metering devices:
  Wet test meter
  Rotameter
  Limiting orifice meter
  Conventional orifice meter
  Calibration of a high-volume sampler
  Calibration of a tape sampler
  Determination of collection efficiency
  Determination of frit porosity
  Factors influencing collection efficiency

# 448

## Effects on Vegetation
3 Days

***Classroom enrollment limit: 60***

Instruction in this course is designed for state and local air pollution control agency personnel interested in obtaining a basic knowledge of air pollution effects on vegetation.

Upon completion of the course, the student will be familiar with the most important physiological and anatomical characteristics of plant life. He should also be able to recognize indicators of pollution effects on vegetation so that he can alert experts of possible air pollution damage to vegetation. Additionally, the student should also be able to work more effectively with state and local agricultural personnel.

The course consists of classroom presentations, informal discussions, a laboratory demonstration of controlled greenhouse experiments, and a field trip to an experimental farm. Major topics include:

Basic plant structure
Role of nutritional imbalances and other environmental stresses
Plant damage caused by insects, diseases, and chemicals
Photochemical pollutant effects on plants
Sulfur oxide pollutants
Fluoride pollutants
Minor pollutants
Symptoms of injury from pollutants
Methods of assessing air pollution injury to vegetation
Plant indicators as a monitoring technique
Chemistry and meteorology of air pollution
Agriculturist's role in controlling air pollution
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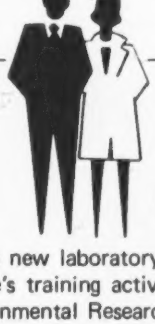

## Special Training in Surveillance and Laboratory

● (By special arrangement upon written request)

The new laboratory facilities provided for the Institute's training activities, located in the National Environmental Research Center in North Carolina, now make it possible to provide special training beyond formal courses. This training, available to surveillance and laboratory personnel, emphasizes the application of reference methods performed on an individual basis.

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# 448

## Effects on Vegetation
## 3 Days

an experimental farm. Major topics include:

- Basic plant structure
- Role of nutritional imbalances and other environmental stresses
- Plant damage caused by insects, diseases, and chemicals
- Photochemical pollutant effects on plants
- Sulfur oxide pollutants
- Fluoride pollutants
- Minor pollutants
- Symptoms of injury from pollutants
- Methods of assessing air pollution injury to vegetation
- Plant indicators as a monitoring technique
- Chemistry and meteorology of air pollution
- Agriculturist's role in controlling air pollution
- Economic assessment of air pollution damage
- Purpose and scope of plant survey
- Experimental and field observations of air pollution damage

● (By special arrangement upon written request)

This course is also offered as a specially designed session for state, county, and local agricultural agency personnel. The primary objective of this special course is to develop a national network of qualified specialists, who upon completion of the course, will participate in follow-up surveys designed to compile data pertaining to air pollution damage to vegetation. Modifications of the course content will be made to achieve this objective.

## Special Training in Surveillance and Laboratory Techniques

● (By special arrangement upon written request)

The new laboratory facilities provided for the Institute's training activities, located in the National Environmental Research Center in North Carolina, now make it possible to provide special training beyond formal courses. This training, available to surveillance and laboratory personnel, emphasizes the application of reference methods performed on an individual basis.

This instruction features bench-side training which can be tailored to the specific needs of the requesting program. This individualized training (available to small groups or individuals) can be designed to stress particular techniques or aspects of sampling and analysis. Students receive individualized instruction and participate in informal discussions with staff members.

## 464

### Analytical Methods for Air Quality Standards
10 Days

*Classroom enrollment limit: 24*

This course is designed for chemists and laboratory technicians responsible for the measurement of ambient air quality. Emphasis is placed upon the reference methods of air quality standards including sulfur dioxide, nitrogen dioxide, photochemical oxidants, reactive hydrocarbons minus methane, carbon monoxide, and particulates. About 75 percent of the course is devoted to laboratory procedures. Analytical determinations are made on air samples, results are computed, and interpretation of results is discussed.

A special seminar is held to review current research on new analytical developments and instrumentation. Major topics of this new course include:

Determination of suspended particulates in the atmosphere
Continuous measurement of carbon monoxide in the atmosphere (nondispersive infrared spectrophotometry)
Determination of sulfur dioxide in the atmosphere (pararosaniline method)
Measurement of photochemical oxidants (chemiluminescence method)
Determination of hydrocarbons corrected for methane
Determination of nitrogen dioxide in the atmosphere
Preparation of controlled atmospheres
Performance specifications for continuous analyzers

Special Notice:

Completion of all classroom and laboratory sessions requires 10 days. However, consideration will be given to candidates for special training who wish to forego the majority of the formal course offering and instead concentrate on selected segments of the six pollutants listed above.

## 463

### Air Quality Monitoring Systems (Planni
5 Days

*Classroom enrollment limit: 36*

This new course is offered to chemists, engineers, and other professionals having major responsibilities in the planning, administration, and operation of air quality monitoring systems. The course is designed to provide maximum benefit to new air pollution personnel or to experienced air pollution personnel who are presently specializing in other areas.

The course includes classroom presentations, panel discussions, demonstrations of data handling systems, and simulation exercises.

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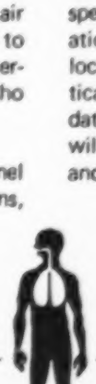

## 465

### Determination of Polycyclic
3 Days

*Classroom enrollment limit: 20*

A fundamental knowledge of organic chemistry is a prerequisite for this course.

Emphasis is placed upon the qualitative and semi-quantitative determination of polycyclic aromatic hydrocarbons (PAH) present in the ambient air which are known or suspected carcinogens. Although determinations will be made for specific compounds, the primary objective of the course is to provide training for the analyses of PAH. Approximately 70 percent of the student's time is spent in laboratory sessions

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## 463

### Air Quality Monitoring Systems (Planning and Administrative Concepts)

### 5 Days

***Classroom enrollment limit: 36***

This new course is offered to chemists, engineers, and other professionals having major responsibilities in the planning, administration, and operation of air quality monitoring systems. The course is designed to provide maximum benefit to new air pollution personnel or to experienced air pollution personnel who are presently specializing in other areas.

The course includes classroom presentations, panel discussions, demonstrations of data handling systems, and simulation exercises.

Toward the end of the course, the participant will design an air quality surveillance system to meet specified objectives. This project will include a delineation of parameters to be measured, sampling site locations, frequency and duration of sampling, analytical methods, and laboratory requirements, plus a data acquisition and retrieval system. The data system will include the basic elements of recording, storage and transmission, validation, and data reduction.

## 465

### Determination of Polycyclic Aromatic Hydrocarbons

### 3 Days

***Classroom enrollment limit: 20***

A fundamental knowledge of organic chemistry is a prerequisite for this course.

Emphasis is placed upon the qualitative and semi-quantitative determination of polycyclic aromatic hydrocarbons (PAH) present in the ambient air which are known or suspected carcinogens. Although determinations will be made for specific compounds, the primary objective of the course is to provide training for the analyses of PAH. Approximately 70 percent of the student's time is spent in laboratory sessions devoted to the separation and identification of PAH. Major topics of this new course include:

Nomenclature of polycyclic aromatic compounds
Fundamentals and applications of column chromatography
Thin-layer chromatography
Ultraviolet absorption analysis
Fluoresence analysis
Activation analysis

# INSTITUTE FOR AIR POLLUTION TRAINING

# SCHEDULE OF RESIDENT COURSES 1972•1973

*All Resident Courses are scheduled for presentation*
*At the Environmental Protection Agency's facilities at Research Triangle Park, N.C. 27711*
*Applicants will receive advance notice of classroom and/or laboratory locations.*

| 1972 Dates | Course Number | Course Title |
|---|---|---|
| July10-14 | 450 | Source Sampling for Air Pollutants (5 Days) |
| July 24-28 | 450 | Source Sampling for Air Pollutants (5 Days) |
| July 25-27 | 458 | Air Pollution Administration I (3 Days, |
| August 7-11 | 450 | Source Sampling for Air Pollutants (5 Days) |
| August 8-10 | 459 | Air Pollution Administration II (3 Days, |
| August 7-18 | 452 | Principles and Practice of Air Pollution Control (Basic 10-Day course) |
| August 21-25 | 454 | Environmental Training Simulations (5 Days) |
| August 21-29 | 440 | Special Topics in Air Quality Management (7 Days) |
| August 28-September 1 | 431 | Air Pollution Control Technology (5 Days) |
| September 5-7 | 444 | Air Pollution Field Enforcement (3 Days) |
| September 5-7 | 439 | Visible Emissions Evaluation (3 Days) |
| September 6-8 | 460 | Air Pollution Administration III (3 Days) |
| September 11-15 | 450 | Source Sampling for Air Pollutants (5 Days) |
| September 11-22 | 464 | Analytical Methods for Air Quality Standards (10 Days) |
| September 11-22 | 452 | Principles and Practice of Air Pollution Control (Basic 10-Day course) |
| September 25-October 6 | 464 | Analytical Methods for Air Quality Standards (10 Days) |

| 1972 Dates | Course Number | Course T |
|---|---|---|
| September 25-29 | 423 | Diffusion<br>Applicati |
| October 2-6 | 450 | Source S |
| October 10-12 | 439 | Visible E |
| October 10-20 | 452 | Principle<br>(Basic 10 |
| October 16-18 | 465 | Determin<br>(3 Days) |
| October 16-20 | 450 | Source S |
| October 17-19 | 439 | Visible E |
| October 23-November 3 | 436 | Measuren |
| October 25-27 | 457 | Air Pollu<br>(3 Days) |
| October 30-November 3 | 450 | Source S |
| November 6-17 | 436 | Measuren |
| November 6-17 | 452 | Principle<br>(Basic 10 |

| Course Title |
|---|
| Source Sampling for Air Pollutants (5 Days) |
| Source Sampling for Air Pollutants (5 Days) |
| Air Pollution Administration I (3 Days, |
| Source Sampling for Air Pollutants (5 Days) |
| Air Pollution Administration II (3 Days, |
| Principles and Practice of Air Pollution Control (Basic 10-Day course) |
| Environmental Training Simulations (5 Days) |
| Special Topics in Air Quality Management (7 Days) |
| Air Pollution Control Technology (5 Days) |
| Air Pollution Field Enforcement (3 Days) |
| Visible Emissions Evaluation (3 Days) |
| Air Pollution Administration III (3 Days) |
| Source Sampling for Air Pollutants (5 Days) |
| Analytical Methods for Air Quality Standards (10 Days) |
| Principles and Practice of Air Pollution Control (Basic 10-Day course) |
| Analytical Methods for Air Quality Standards (10 Days) |

| 1972 Dates | Course Number | Course Title |
|---|---|---|
| September 25-29 | 423 | Diffusion of Air Pollution – Theory and Application (5 Days) |
| October 2-6 | 450 | Source Sampling for Air Pollutants (5 Days) |
| October 10-12 | 439 | Visible Emissions Evaluation (3 Days) |
| October 10-20 | 452 | Principles and Practice of Air Pollution Control (Basic 10-Day course) |
| October 16-18 | 465 | Determination of Polycyclic Aromatic Hydrocarbons (3 Days) |
| October 16-20 | 450 | Source Sampling for Air Pollutants (5 Days) |
| October 17-19 | 439 | Visible Emissions Evaluation (3 Days) |
| October 23-November 3 | 436 | Measurement of Atmospheric Metals (10 Days) |
| October 25-27 | 457 | Air Pollution Workshop in Public Communications (3 Days) |
| October 30-November 3 | 450 | Source Sampling for Air Pollutants (5 Days) |
| November 6-17 | 436 | Measurement of Atmospheric Metals (10 Days) |
| November 6-17 | 452 | Principles and Practice of Air Pollution Control (Basic 10-Day course) |

| 1972 Dates | Course Number | Course Title |
|---|---|---|
| November 7-9 | 439 | Visible Emissions Evaluation (3 Days) |
| November 13-17 | 450 | Source Sampling for Air Pollutants (5 Days) |
| November 20-21 | 462 | Air Pollution Agency Planning Seminar (2 Days) |
| November 27-December 1 | 461 | Air Pollution Systems Management (5 Days) |
| December 4-8 | 411 | Air Pollution Meteorology (5 Days) |
| December 11-15 | 463 | Air Quality Monitoring Systems (5 Days) |

Courses 413 and 415 are now scheduled sequentially in a two-week block.

UNITED STATES · ENVIRONMENTAL PROTECTION AGENCY

| 1973 Dates | Course Number | Course Title |
|---|---|---|
| January 8-12 | 450 | Source Sampling for Air Pollutants (5 Days) |
| January 8-19 | 452 | Principles and Practice of Air Pollution Control (Basic 10-Day course) |

| 1973 Dates | Course Number | Course Title |
|---|---|---|
| January 22-26 | 420 | Air Pollution Microscopy |
| January 22-26 | 411 | Air Pollution Meteorolog |
| January 29-February 2 | 450 | Source Sampling for Air |
| January 29-February 9 | 464 | Analytical Methods for A<br>(10 Days) |
| February 5-9 | 415 | Control of Gaseous Emis |
| February 6-8 | 439 | Visible Emissions Evalua |
| February 12-16 | 413 | Control of Particulate E |
| February 12-23 | 464 | Analytical Methods for A<br>(10 Days) |
| February 12-23 | 452 | Principles and Practice of<br>(Basic 10-Day course) |
| February 26-March 2 | 450 | Source Sampling for Air |
| February 26-March 6 | 440 | Special Topics in Air Qua |
| February 27-March 1 | 459 | Air Pollution Administra |
| March 5-9 | 411 | Air Pollution Meteorolog |
| March 12-23 | 452 | Principles and Practice of<br>(Basic 10-Day course) |
| March 14-16 | 460 | Air Pollution Administrat |
| March 19-21 | 465 | Determination of Polycyc<br>(3 Days) |
| March 26-30 | 411 | Air Pollution Meteorology |
| March 26-30 | 450 | Source Sampling for Air |

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on Agency Planning Seminar (2 Days)

on Systems Management (5 Days)

on Meteorology (5 Days)

Monitoring Systems (5 Days)

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in a two-week block.

UNITED STATES
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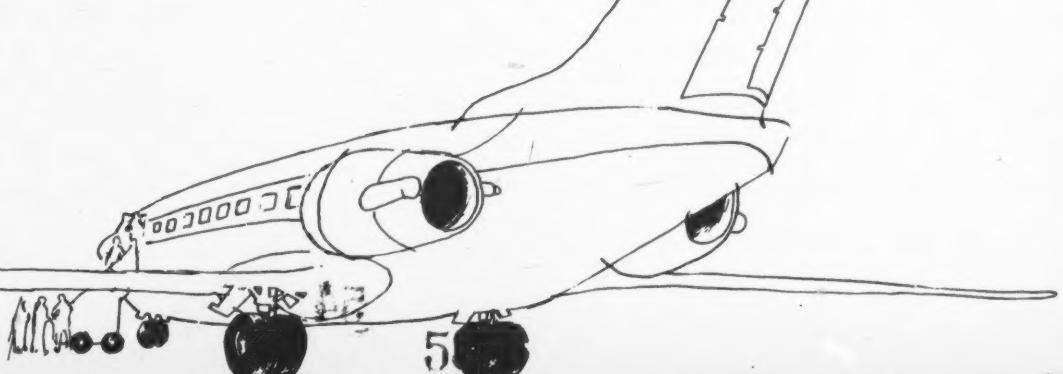
| 1973 Dates | Course Number | Course Title |
|---|---|---|
| January 22-26 | 420 | Air Pollution Microscopy (5 Days) |
| January 22-26 | 411 | Air Pollution Meteorology (5 Days) |
| January 29-February 2 | 450 | Source Sampling for Air Pollutants (5 Days) |
| January 29-February 9 | 464 | Analytical Methods for Air Quality Standards (10 Days) |
| February 5-9 | 415 | Control of Gaseous Emissions (5 Days) |
| February 6-8 | 439 | Visible Emissions Evaluation (3 Days) |
| February 12-16 | 413 | Control of Particulate Emissions (5 Days) |
| February 12-23 | 464 | Analytical Methods for Air Quality Standards (10 Days) |
| February 12-23 | 452 | Principles and Practice of Air Pollution Control (Basic 10-Day course) |
| February 26-March 2 | 450 | Source Sampling for Air Pollutants (5 Days) |
| February 26-March 6 | 440 | Special Topics in Air Quality Management (7 Days) |
| February 27-March 1 | 459 | Air Pollution Administration I (3 Days) |
| March 5-9 | 411 | Air Pollution Meteorology (5 Days) |
| March 12-23 | 452 | Principles and Practice of Air Pollution Control (Basic 10-Day course) |
| March 14-16 | 460 | Air Pollution Administration III (3 Days) |
| March 19-21 | 465 | Determination of Polycyclic Aromatic Hydrocarbons (3 Days) |
| March 26-30 | 411 | Air Pollution Meteorology (5 Days) |
| March 26-30 | 450 | Source Sampling for Air Pollutants (5 Days) |

| 1973 Dates | Course Number | Course Title |
|---|---|---|
| April 3-5 | 439 | Visible Emissions Evaluation (3 Days) |
| April 9-20 | 452 | Principles and Practice of Air Pollution Control (Basic 10-Day course) |
| April 16-20 | 405 | Sampling and Identification of Pollen and Fungus Spore Aero-Allergens (5 Days) |
| April 23-May 4 | 464 | Analytical Methods for Air Quality Standards (10 Days) |
| May 7-9 | 448 | Effects on Vegetation (3 Days) |
| May 7-9 | 457 | Air Pollution Workshop in Public Communications (3 Days) |
| May 7-18 | 452 | Principles and Practice of Air Pollution Control (Basic 10-Day course) |
| May 14-25 | 464 | Analytical Methods for Air Quality Standards (10 Days) |
| May 21-23 | 455 | Air Pollution Principles for Planners (3 Days) |
| May21-25 | 423 | Diffusion of Air Pollution – Theory and Application (5 Days) |
| May 30-June 1 | 456 | Regional Planning for Air Pollution Control Officers (3 Days) |
| June 4-15 | 436 | Measurement of Atmospheric Metals (10 Days) |
| June 4-15 | 452 | Principles and Practice of Air Pollution Control (Basic 10-Day course) |
| June 18-22 | 463 | Air Quality Monitoring Systems (5 Days) |
| June 18-22 | 447 | Meteorological Instrumentation in Air Pollution (5 Days) |
| June 18-29 | 436 | Measurement of Atomspheric Metals (10 Days) |
| June 25-29 | 454 | Environmental Training Simulations (5 Days) |

# INSTITUTE FOR AIR POLLUTION TRAINING

# SCHEDULE OF FIELD COURSES 1972•1973

*The following courses have been scheduled for presentation at the locations listed on the opposite page. Additional information may be obtained from the Registrar of the Institute for Air Pollution Training, at Research Triangle Park, N.C. 27711 Application forms are provided on pages 98 to 102.*



## Region One

| 1972 Dates | Course Number | Course Title and Field Training Location |
|---|---|---|
| August 21-25 | 431 | Air Pollution Control Technology<br>(5 Days, Boston, Massachusetts) |
| October 30-November 1 | 455 | Air Pollution Principles for Planners<br>(3 Days, Boston, Massachusetts) |
| October 30-November 3 | 411 | Air Pollution Meteorology<br>(5 Days, Boston, Massachusetts) |
| November 1-3 | 456 | Planning Principles for Air Pollution Control Officers (3 Days, Boston, Massachusetts) |
| **1973 Dates** | | |
| April 17-19 | 439 | Visible Emissions Evaluation<br>(3 Days, Boston, Massachusetts) |
| May 7-11 | 415 | Control of Gaseous Emissions<br>(5 Days, Boston, Massachusetts) |
| May 14-18 | 413 | Control of Particulate Emissions<br>(5 Days, Boston, Massachusetts) |

## Region Two

| 1972 Dates | Course Number | Course Title and Field Training Location |
|---|---|---|
| August 21-25 | 435 | Atmospheric Sampling<br>(5 Days, San Juan, Puerto Rico) |
| September 12-14 | 439 | Visible Emissions Evaluation<br>(3 Days, Edison, New Jersey) |
| October 2-6 | 431 | Air Pollution Control Technology<br>(5 Days, Albany, New York) |

## Region Two

| 1973 Dates | Course Number | Course Title and Field Training Location |
|---|---|---|
| April 9-13 | 427 | Combustion Evaluation<br>(5 Days, Albany, New York) |
| May 22-24 | 458 | Air Pollution Administration I<br>(3 Days, Albany, New York) |
| June 4-8 | 420 | Air Pollution Microscopy<br>(5 Days, Edison, New Jersey) |

## Region Three

| 1972 Dates | Course Number | Course Title and Field Training Location |
|---|---|---|
| August 8-10 | 439 | Visible Emissions Evaluation<br>(3 Days, State College, Pennsylvania) |
| **1973 Dates** | | |
| January 9-11 | 458 | Air Pollution Administration I<br>(3 Days, Philadelphia, Pennsylvania) |
| April 23-26 | 461 | Air Pollution Systems Management<br>(4 Days, Philadelphia, Pennsylvania) |
| May 7-11 | 435 | Atmospheric Sampling<br>(5 Days, Philadelphia, Pennsylvania) |
| May 31-June 1 | 462 | Air Pollution Agency Planning Seminar<br>(2 Days, Philadelphia, Pennsylvania) |

Courses 413 and 415 are now scheduled sequentially in a two-week block.

## Region Four

| 1972 Dates | Course Number | Course Title and Field Training Location |
|---|---|---|
| July 11-13 | 439 | Visible Emissions Evaluation<br>(3 Days, Orlando, Florida) |
| October 16-20 | 431 | Air Pollution Control Technology<br>(5 Days, Atlanta, Georgia) |
| **1973 Dates** | | |
| February 27-March 1 | 439 | Visible Emissions Evaluation<br>(3 Days, Atlanta, Georgia) |
| March 5-9 | 415 | Control of Gaseous Emissions<br>(5 Days, Atlanta, Georgia) |
| March 12-16 | 413 | Control of Particulate Emissions<br>(5 Days, Atlanta, Georgia) |

## Region Five

| 1972 Dates | Course Number | Course Title and Field Training Location |
|---|---|---|
| July 25-27 | 444 | Air Pollution Field Enforcement<br>(3 Days, Cincinnati, Ohio) |
| August 22-24 | 439 | Visible Emissions Evaluation<br>(3 Days, Cincinnati, Ohio) |
| October 31-November 2 | 444 | Air Pollution Field Enforcement<br>(3 Days, Chicago, Illinois) |
| December 11-15 | 431 | Air Pollution Control Technology<br>(5 Days, Cincinnati, Ohio) |

## Region Five

| 1973 Dates | Course Number | Course Title and Field Training Location |
|---|---|---|
| January 8-12 | 435 | Atmospheric Sampling<br>(5 Days, Cincinnati, Ohio) |
| June 4-8 | 413 | Control of Particulate Emissions<br>(5 Days, Chicago, Illinois) |
| June 18-22 | 801* | Basic Environmental Statistics<br>(5 Days, Cincinnati, Ohio) |
| June 25-29 | 426 | Statistical Evaluation of Air Pollution Data<br>(5 Days, Cincinnati, Ohio) |

*Office of Water Programs course 801 (Basic Environmental Statistics) —or equivalent college training in statistics — is a prerequisite for IAPT course 426. In addition, enrollees are required to complete a programmed text in basic statistics for home study, prior to reporting for course 426.

## Region Six

| 1972 Dates | Course Number | Course Title and Field Training Location |
|---|---|---|
| September 18-22 | 431 | Air Pollution Control Technology<br>(5 Days, Dallas, Texas) |
| November 27-December 1 | 435 | Atmospheric Sampling<br>(5 Days, Dallas, Texas) |
| December 5-7 | 444 | Air Pollution Field Enforcement<br>(3 Days, Dallas, Texas) |

Courses 413 and 415 are now scheduled sequentially in a two-week block.

## Region Six

| 1973 Dates | Course Number | Course Title and Field Training Location |
|---|---|---|
| January 8-12 | 415 | Control of Gaseous Emissions<br>(5 Days, Dallas, Texas) |
| January 15-19 | 413 | Control of Particulate Emissions<br>(5 Days, Dallas, Texas) |
| January 29-31 | 455 | Air Pollution Principles for Planners<br>(3 Days, Dallas, Texas) |
| January 31-February 2 | 456 | Planning Principles for Air Pollution Control Officers (3 Days, Dallas, Texas) |
| May 14-18 | 801* | Basic Environmental Statistics<br>(5 Days, Dallas, Texas) |
| May 21-25 | 426 | Statisical Evaluation of Air Pollution Data<br>(5 Days, Dallas, Texas) |
| May 22-24 | 439 | Visible Emissions Evaluation<br>(3 Days, Dallas, Texas) |

## Region Seven

| 1972 Dates | Course Number | Course Title and Field Training Location |
|---|---|---|
| September 19-21 | 444 | Air Pollution Field Enforcement<br>(3 Days, Kansas City, Missouri) |

Courses 413 and 415 are now scheduled sequentially in a two-week block.

*Office of Water Programs course 801 (Basic Environmental Statistics) —or equivalent college training in statistics — is a prerequisite for IAPT course 426. In addition enrollees are required to complete a programmed text in basic statistics for home study prior to reporting for course 426.

## Region Seven

| 1973 Dates | Course Number | Course Title and Field Training Location |
|---|---|---|
| March 5-9 | 435 | Atmospheric Sampling<br>(5 Days, Kansas City, Missouri) |
| March 13-15 | 439 | Visible Emissions Evaluation<br>(3 Days, Kansas City, Missouri) |
| May 7-11 | 427 | Combustion Evaluation<br>(5 Days, Kansas City, Missouri) |

## Region Eight

| 1972 Dates | Course Number | Course Title and Field Training Location |
|---|---|---|
| July 17-21 | 420 | Air Pollution Microscopy<br>(5 Days, Denver, Colorado) |
| November 27-December 1 | 415 | Control of Gaseous Emissions<br>(5 Days, Denver, Colorado) |
| December 4-8 | 413 | Control of Particulate Emissions<br>(5 Days, Denver, Colorado) |
| **1973 Dates** | | |
| March 27-29 | 444 | Air Pollution Field Enforcement<br>(3 Days, Denver, Colorado) |
| April 2-4 | 455 | Air Pollution Principles for Planners<br>(3 Days, Denver, Colorado) |
| April 4-6 | 456 | Planning Principles for Air Pollution Control Officers (3 Days, Denver, Colorado) |

## Region Nine

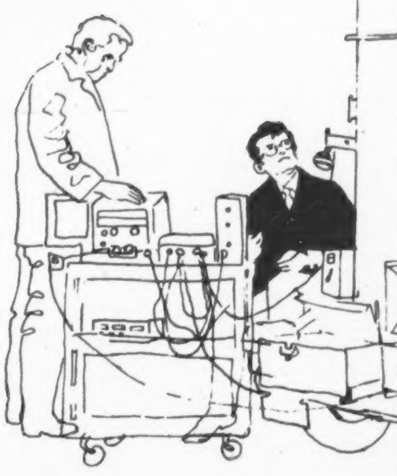
| 1972 Dates | Course Number | Course Title and Field Training Location |
|---|---|---|
| October 2-4 | 455 | Air Pollution Principles for Planners (3 Days, San Francisco, California) |
| October 4-6 | 456 | Planning Principles for Air Pollution Control Officers (3 Days, San Francisco, California) |
| October 10-12 | 444 | Air Pollution Field Enforcement (3 Days, San Francisco, California) |
| November 6-10 | 420 | Air Pollution Microscopy (5 Days, San Francisco, California) |
| **1973 Dates** | | |
| January 22-26 | 454 | Environmental Training Simulations (5 Days, Los Angeles, California) |
| January 23-25 | 439 | Visible Emissions Evaluation (3 Days, Sacramento, California) |

## Region Ten

| 1972 Dates | Course Number | Course Title and Field Training Location |
|---|---|---|
| September 11-15 | 415 | Control of Gaseous Emissions (5 Days, Seattle, Washington) |
| September 18-22 | 413 | Control of Particulate Emissions (5 Days, Seattle, Washington) |
| September 26-28 | 444 | Air Pollution Field Enforcement (3 Days, Seattle, Washington) |

## Region Ten

| 1973 Dates | Course Number | Course Title and Field Training Location |
|---|---|---|
| April 2-6 | 435 | Atmospheric Sampling (5 Days, Seattle, Washington) |
| April 30-<br>May 2 | 455 | Air Pollution Principles for Planners (3 Days, Seattle, Washington) |
| May 2-4 | 456 | Planning Principles for Air Pollution Control Officers (3 Days, Seattle, Washington) |



# University Training Programs and Special Projects Branch

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
Office of Air Programs
Stationary Source Pollution Control Programs
Manpower Development Staff
Research Triangle Park, North Carolina 27711
July 1972

# Special Projects Branch of the Manpower Development Staff

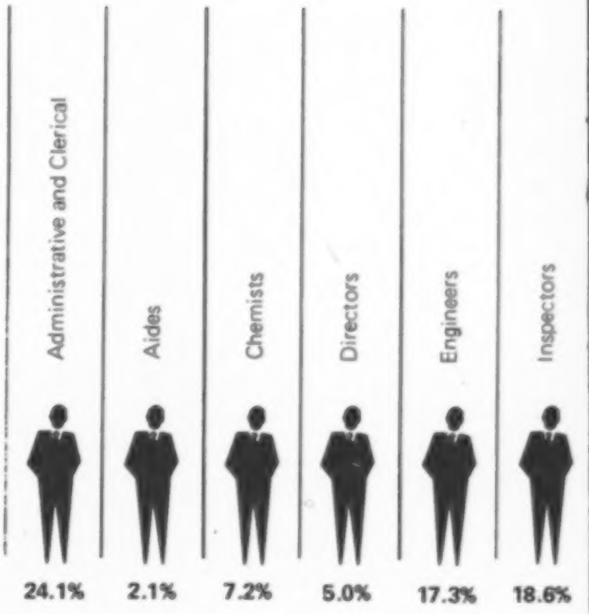


**Figure One:** Budgeted positions in state and local air pollution control agencies

Designing and implementing programs to meet national manpower and training needs in the field of air pollution control are primary responsibilities of the Special Projects Branch of the Manpower Development Staff. Major emphasis is placed upon providing support and assistance at state and local levels. Programs are designed to increase the national resource of qualified professional and technical manpower, to make employment opportunities in air pollution control more attractive to applicants, to find more efficient means of utilizing existing manpower, and to upgrade the technical competency of air pollution control agency personnel.

Manpower planning is essential to the effective utilization and retention of the air pollution control multidisciplinary staff. There is no single occupational field involved in solving air pollution problems, but rather, the distinctive requirements involve the application of a broad spectrum of skills and knowledge in more than 50 career disciplines.

Current manpower estimates and projected needs for manpower are major components in manpower planning. Survey information establishes base data used to plan manpower development activities such as manpower training, staffing, and salary upgrading. The Manpower Development Staff has completed an upgraded survey of all 264 state and local air pollution control agencies. Information from this survey has been computerized and will be upgraded regularly. Results of air pollution control surveys are available to those interested.

In addition to survey data, the Special Projects Branch maintains updated manpower model projections for ea
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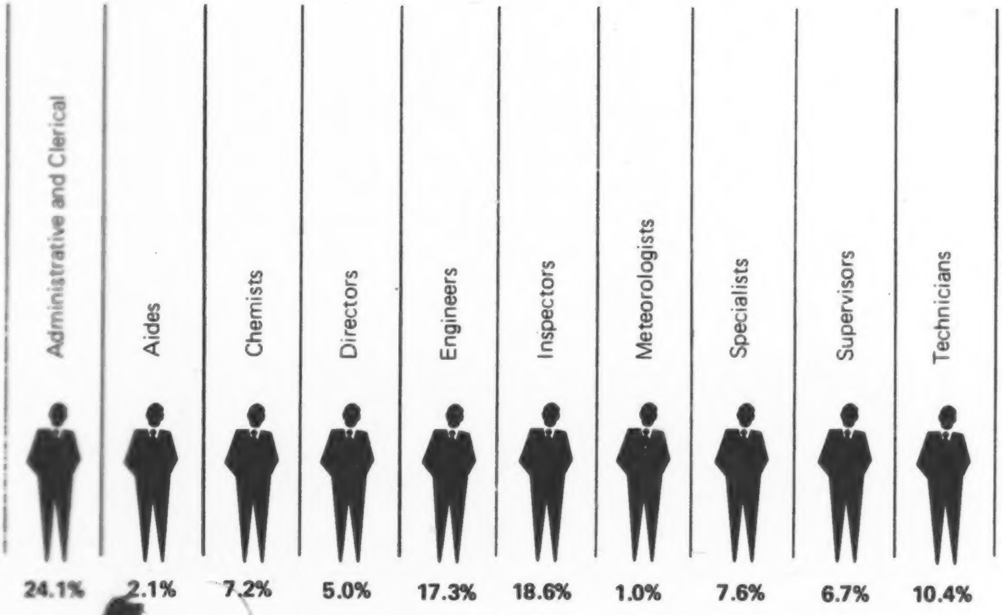

**Figure One.** Budgeted positions in state and local air pollution control agencies

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Current manpower estimates and projected needs for manpower are major components in manpower planning. Survey information establishes base data used to plan manpower development activities such as manpower training, staffing, and salary upgrading. The Manpower Development Staff has completed an upgraded survey of all 264 state and local air pollution control agencies. Information from this survey has been computerized and will be upgraded regularly. Results of air pollution control surveys are available to those interested.

In addition to survey data, the Special Projects Branch maintains updated manpower model projections for each air quality control region with state totals. The manpower model involves application of input parameters such as population, land area, number of manufacturing establishments, and capital investments to predictive equations resulting in a man-years estimate of manpower required in each of the major functional areas of agency activity. Projected manpower estimates together with updated manpower survey information provide data that can be used in planning a multitude of programs.

In order to better answer questions relevant to air pollution control agency manpower planning, development, and training, a data base has been prepared which describes the tasks performed by control agency personnel and the skills and knowledge they must have to perform those tasks effectively. This information is being used in planning EPA training

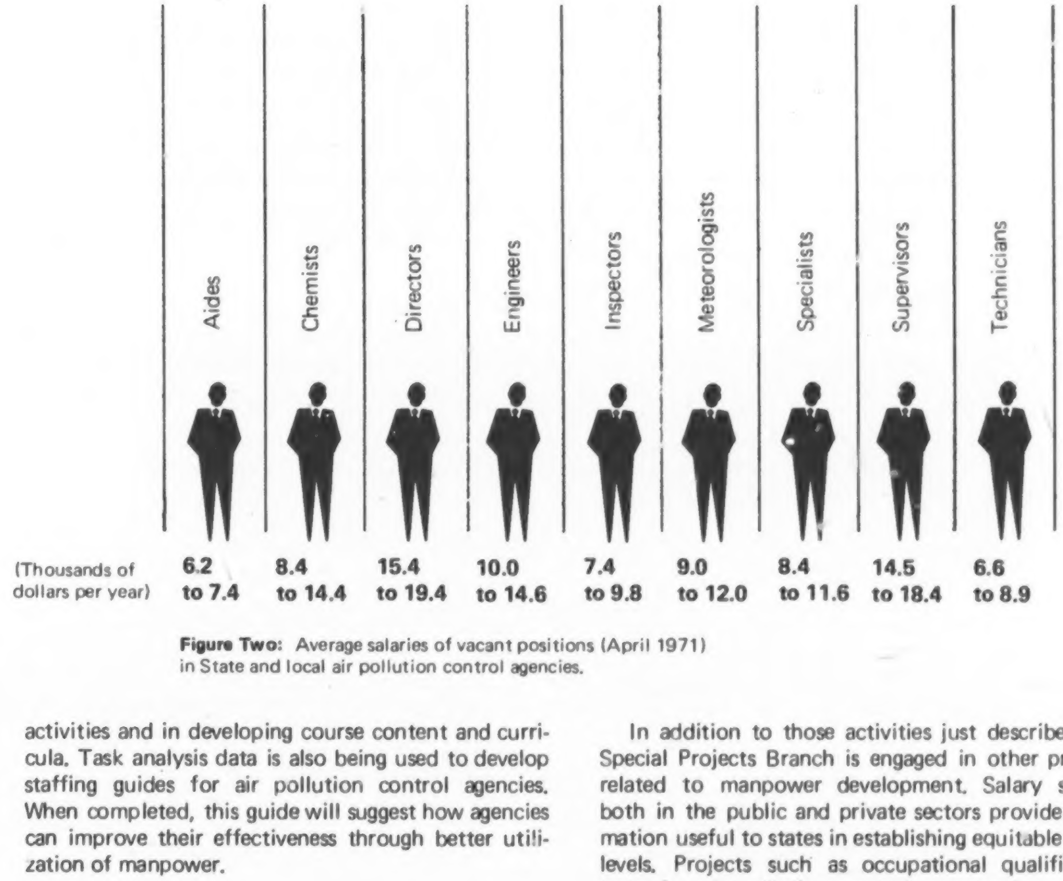

**Figure Two:** Average salaries of vacant positions (April 1971) in State and local air pollution control agencies.

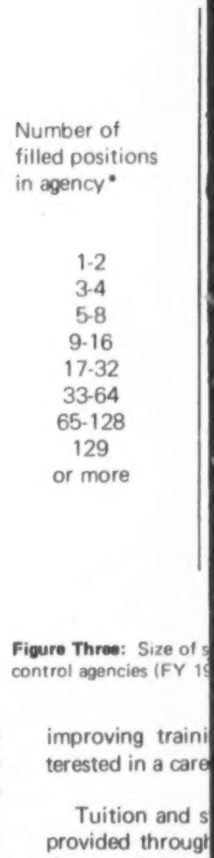

**Figure Three:** Size of s
control agencies (FY 1

activities and in developing course content and curricula. Task analysis data is also being used to develop staffing guides for air pollution control agencies. When completed, this guide will suggest how agencies can improve their effectiveness through better utilization of manpower.

The Office of Air Programs, in cooperation with the U.S. Civil Service Commission and air pollution control agencies, has completed "Guide Class Specifications for Air Pollution Control Positions in State and Local Programs" which provides agencies with illustrative materials that can be used in developing job specifications for their air pollution control personnel. This Guide is available from the Special Projects Branch, Manpower Development Staff, Office of Air Programs.

In addition to those activities just described, the Special Projects Branch is engaged in other projects related to manpower development. Salary studies both in the public and private sectors provide information useful to states in establishing equitable salary levels. Projects such as occupational qualification tests for air pollution control personnel are being planned to provide state and local governments with current information that can be used in improving manpower programs.

The Special Projects Branch also administers programs which provide university grants, traineeships, and special fellowships for students seeking full-time training in air pollution control or related subjects at universities and other institutions of higher learning. Air pollution training grants assist public and other nonprofit institutions in establishing, expanding, and

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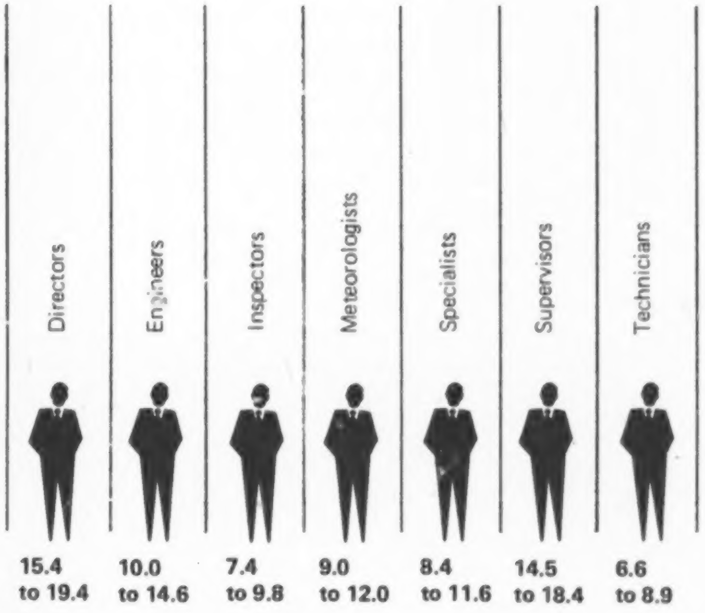

ge salaries of vacant positions (April 1971)
r pollution control agencies.

| Number of filled positions in agency* | Number of agencies | Percent |
|---|---|---|
| 1-2 | 30 | 11.4 |
| 3-4 | 40 | 15.2 |
| 5-8 | 79 | 30.0 |
| 9-16 | 46 | 17.4 |
| 17-32 | 42 | 15.9 |
| 33-64 | 13 | 4.9 |
| 65-128 | 7 | 2.6 |
| 129 or more | 7 | 2.6 |
| | Total 264 | 100.0 |

*Includes full and part-time employees

**Figure Three:** Size of state and local air pollution control agencies (FY 1971).

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In addition to those activities just described, the Special Projects Branch is engaged in other projects related to manpower development. Salary studies both in the public and private sectors provide information useful to states in establishing equitable salary levels. Projects such as occupational qualification tests for air pollution control personnel are being planned to provide state and local governments with current information that can be used in improving manpower programs.

The Special Projects Branch also administers programs which provide university grants, traineeships, and special fellowships for students seeking full-time training in air pollution control or related subjects at universities and other institutions of higher learning. Air pollution training grants assist public and other nonprofit institutions in establishing, expanding, and improving training opportunities for individuals interested in a career in air pollution control.

Tuition and stipend assistance to students may be provided through traineeships from the grant institutions or through fellowships by the Office of Air Programs. Additional information on training grant and fellowship programs is located in the latter part of this booklet.

Air pollution control manpower and training programs are developed under policy guidelines established by the Assistant Administrator for Planning and Management and are implemented with the assistance of the Manpower Representatives of the ten EPA Regional Offices. A close liaison is maintained with manpower and training programs of other Federal agencies.

# University Consortia for Environmental Protection

Groups of major universities are redirecting their talents and resources toward a new effort to combat air pollution and other environmental protection problems through the formation of university consortia. While initially their efforts are concentrated on air pollution control, it is expected that they will gradually expand to embrace other critical environmental areas. Constituted to increase capability in solving multidisciplinary problems requiring the competence and resources of varied institutions, consortia are not meant to represent individual strengths of the participating universities, but rather to combine these strengths into an integrated coherent effort. At present, four consortia have been formally established and are now in various stages of development.

A consortium is designed to have measurable impact upon environmental control through its training program and service activities. A major responsibility of a consortium is to plan, design, and conduct a coordinated training program, primarily at the master's level, directed at air pollution control. While embracing traditional areas such as meteorology, emission control, and sampling and analysis, the program also involves land-use planning, transportation planning, legislation, economic and related effects, implementation plan development, standard setting, and episode control plans. The program is basically oriented toward problem solving. Supported by the faculties of the participating universities, a consortium eliminates the need for duplicated programs in the individual universities and provides superior training to a greater number at a lower cost per student than could be furnished by individual universities. Such training programs are attractive to industry as well as public control agencies, because both require personnel with similar knowledge and skills.

Dr. John T. Middleton, Deputy Assistant Administrator for Air Programs, has said that air pollution is a social problem. He believes that its solution depends upon public understanding and political action. Assistance in these areas will be of prime concern to consortia universities.

Dr. Harry P. Kramer, Director, Manpower Development Staff, said that new, more effective efforts are essential to meet the qualitative and quantitative manpower needs of State and local control agencies. A concurrent need exists to develop a system to provide a broad spectrum of technical assistance to these agencies. For example, faculty members aligned with consortia, and consortia as organizations, will become involved with lawmakers, planners, citizens' groups, and most importantly, with State and local agency directors by furnishing technical services and other assistance in dealing with long-range problems. Opportunities for student involvment in such activities provide valuable experience in this training and development.

## Chairman of Consortia on Air Pollution

**Region One**
**New England Consortium on**
**Environmental Protection**
Dr. Kenneth W. Skrable
Nuclear Center
Lowell Technological Institute
Lowell, Massachusetts 01854

Northeastern University, University of Massachusetts, Massachusetts Institute of Technology, Boston University, Harvard University, Lowell Technological Institute and Tufts University.

**Region Two**
**Consortium on Air Pollution**
Dr. James P. Friend
Associate Professor
Department of Meteorology and Oceanography
New York University
Bronx, New York 10453

City College of the City of New York,
Cooper Union, New York University, Polytechnic Institute of Brooklyn
Princeton University, Newark College of Engineering,
and Rutgers University.

**Region Three**
**Consortium on Air Pollution**
Dr. P. Walter Purdom
Director, Center for Urban Research
and Environmental Studies
Drexel University
Philadelphia, Pennsylvania 19104

Drexel University, Howard University, Johns Hopkins University,
Pennsylvania State University, Temple University,
University of Delaware, University of Maryland, University of Pittsburgh,
University of Virginia and University of West Virginia.

**Region Four**
**Triangle Universities Consortium**
**on Air Pollution**
Arthur C. Stern, M.E., M.S.
School of Public Health
University of North Carolina
Chapel Hill, North Carolina 27514

University of North Carolina, Duke University and North Carolina State University.

**Region Five**
**Consortium on Air Pollution**
Dr. James J. Stukel, Assistant Professor,
Mechanical and Civil Engineering
University of Illinois
Urbana, Illinois 61801

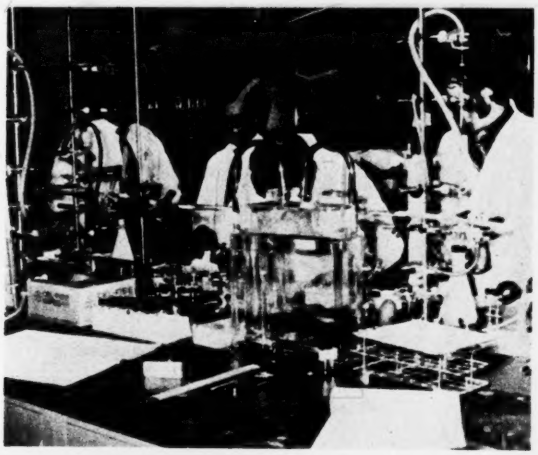
University of Illinois, Northwestern University, University of Minnesota, Purdue University, Illinois Institute of Technology, and University of Notre Dame.

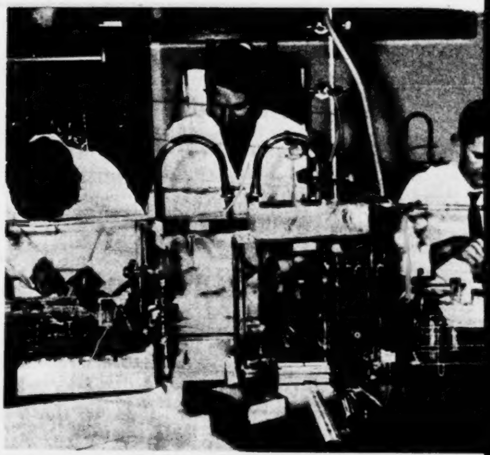
**Region Six**
**Consortium on Air Pollution**
Dr. Frank Worley
Associate Chairman and Associate Professor,
Chemical Engineering
University of Houston
Houston, Texas 77004

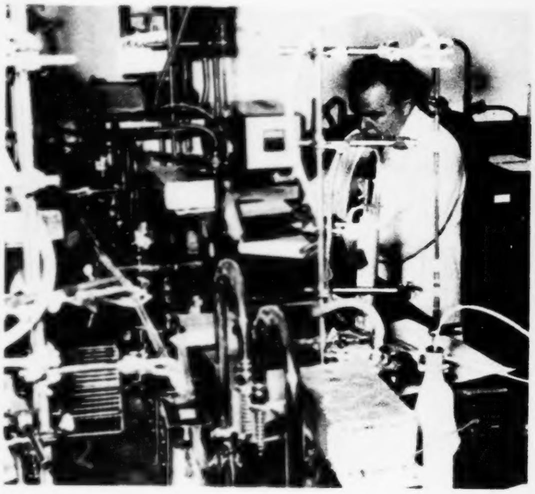
Baylor University, Rice University, University of Texas, Austin;
University of Texas, El Paso; University of Texas, Houston;
University of Houston, and Texas A & M.

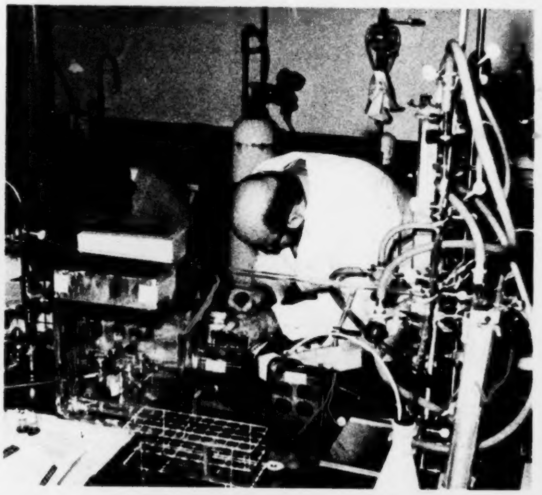
**Region Nine**
**Pacific Southwest Universities**
**Air Pollution Association**
Dr. K. William Lefland
Associate Director
School of Public Administration
University of Southern California
Los Angeles, California 90012

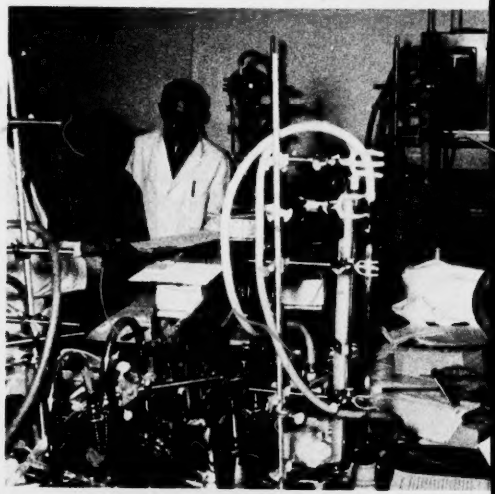
University of Southern California
University of California, Irvine; University of California, Los Angeles;
and University of California, Riverside.

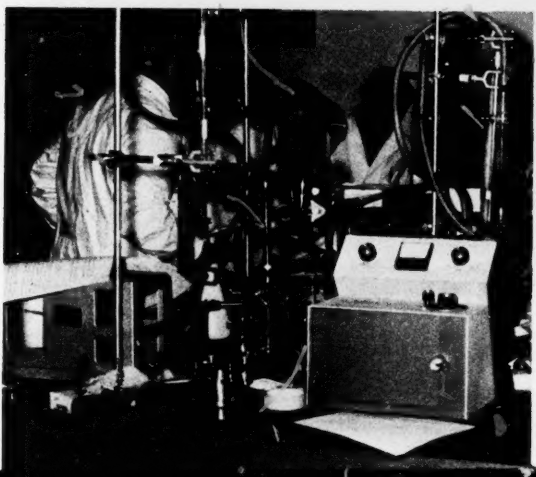


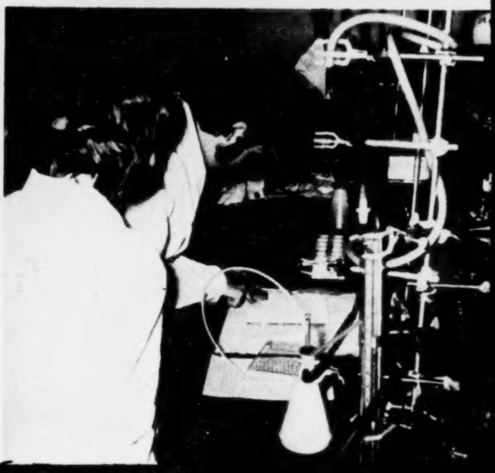












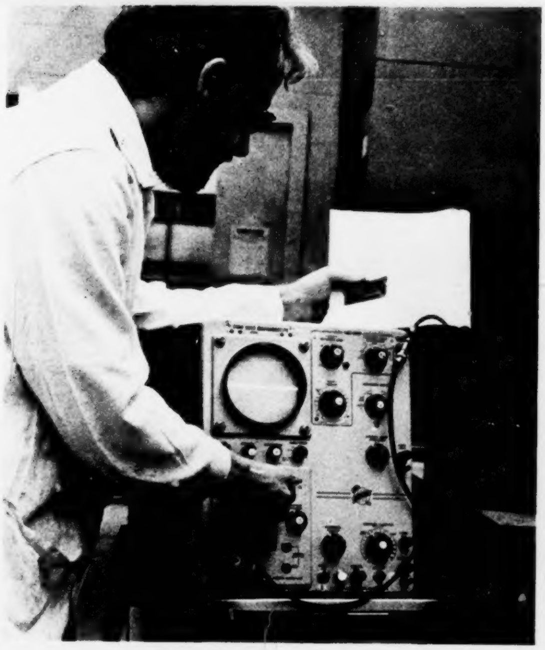
# INTRODUCTION

The Clean Air Act, as amended and subsequent amendments make provision for the development of qualified air pollution control personnel.

The Manpower Development Staff, Office of Air Programs which has prime responsibility for this task, develops training opportunities at recognized institutions throughout the country.

In addition, this office awards a limited number of fellowships to qualified scholars who wish to pursue graduate studies in air pollution control at a recognized institution of their choice.

This catalogue lists the institutions that offer graduate and specialist training programs supported by this office and describes briefly the purpose, content, and requirements of these programs and of the air pollution fellowship program.



Pulse characteristics being checked from a "hot wire" anemometer detector unit, for application to liquid aerosol studies.

Aspirating a liquid sample into an Atomic Absorbtion Spectrophotometer. This unit determines trace metal concentrations in solution.

Body Plethys
pliance of lung

Divers making ready for a 200 foot dive in research submarine to observe stability of incinerator residue on ocean floor.

One phase of an overall program to evaluate respiratory responses to various dusts and for gases is the insertion of a guinea pig into a dust exposure chamber.

''hot wire''
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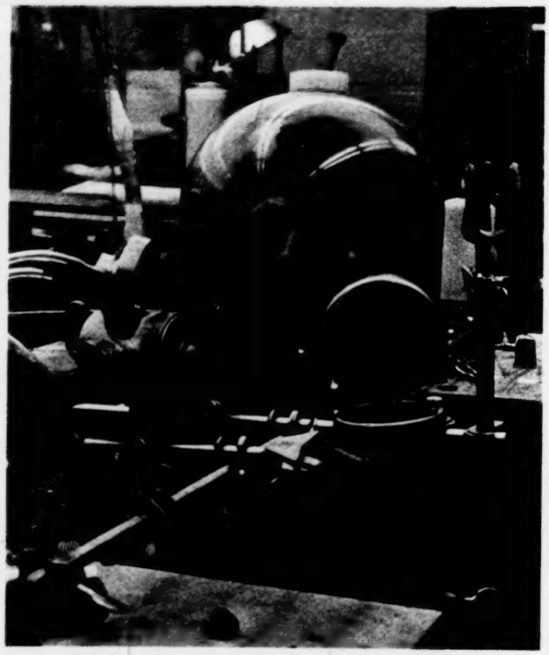
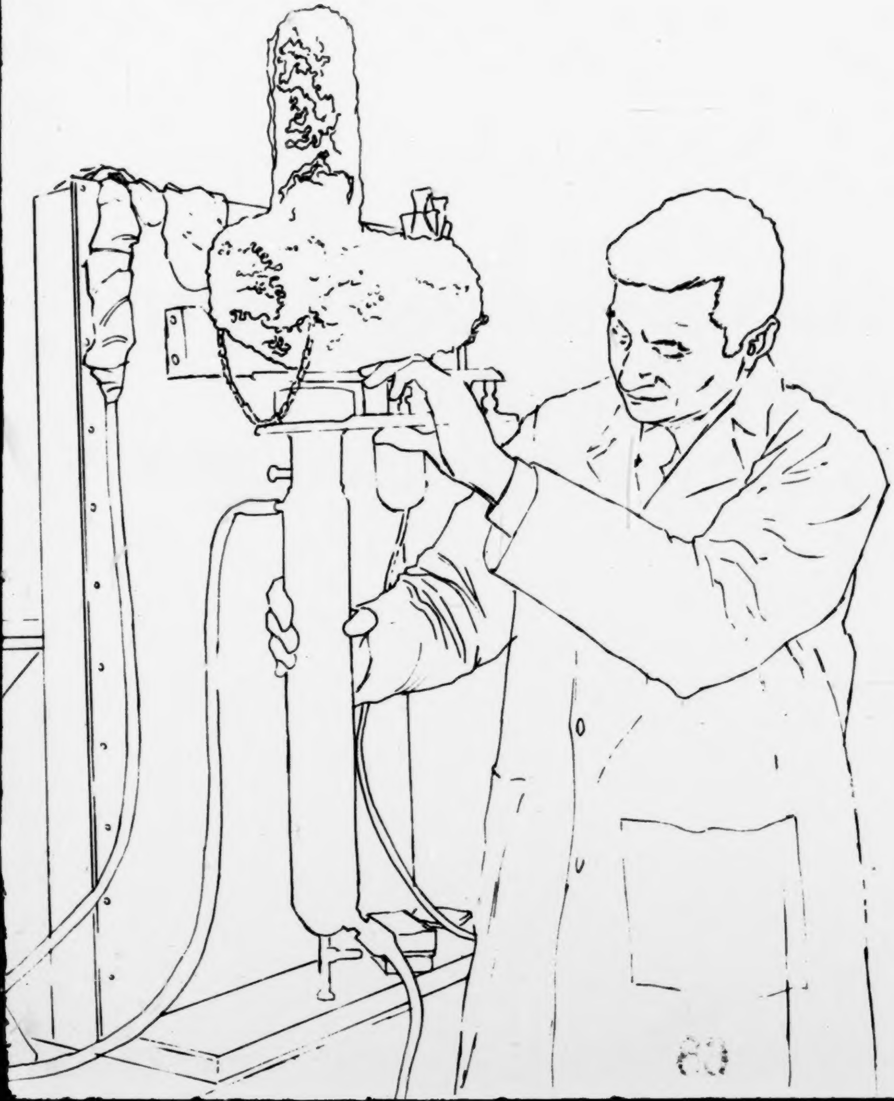
Aspirating a liquid sample into an Atomic Absorbtion Spectrophotometer. This unit determines trace metal concentrations in solution.



Body Plethysmograph measures flow resistance and compliance of lungs.

**The purpose of the Graduate Training Program is to provide graduate level education for qualified students who wish to pursue careers in air pollution control.**



# Graduate Training Programs in Air Pollution Control Technology

**General Information:**

Stipends are awarded for the support of persons engaged full-time in preparation for a career in the field of air pollution control.

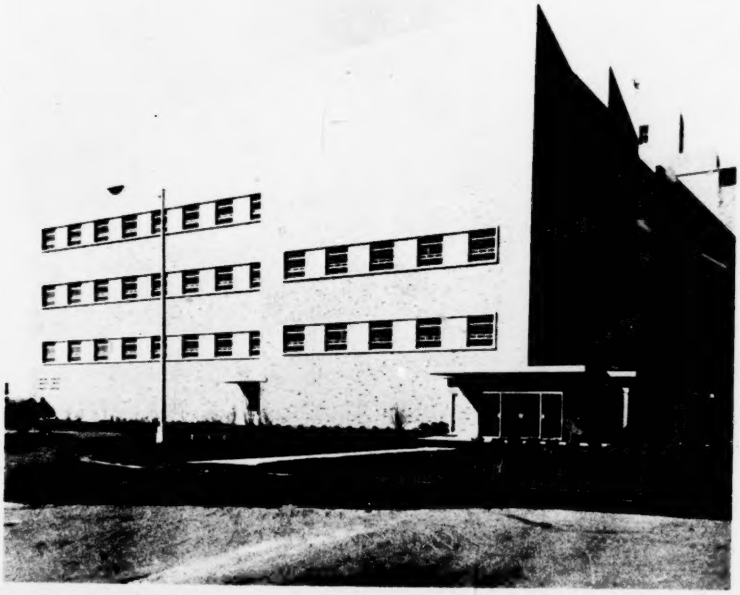
The university program director has complete responsibility for the selection of students, and for the allocation of funds thereto. To receive a stipend from a graduate training grant, the student must meet the following minimum eligibility requirements:

**1.** Possess at least a Bachelor's degree.

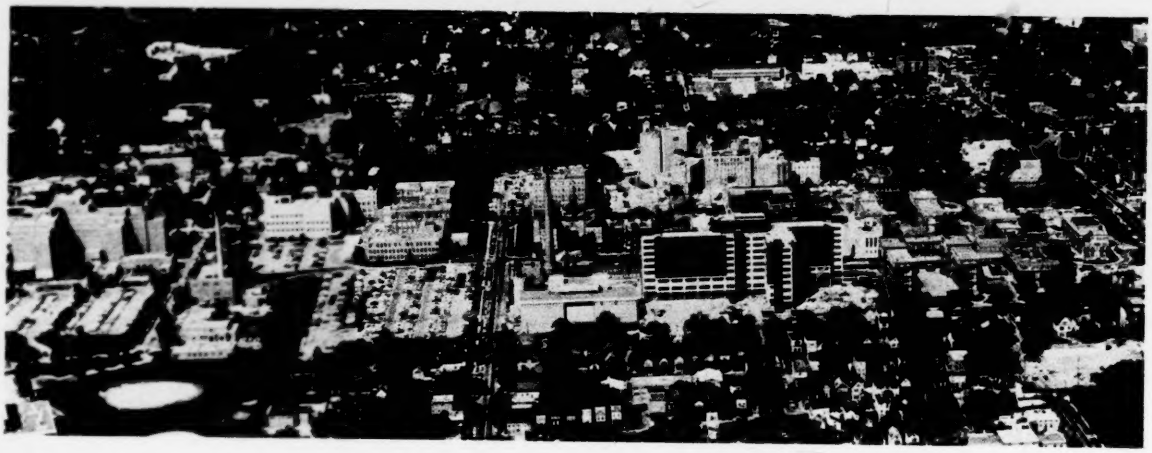
**2.** Meet the usual requirements of the graduate school of the grantee institution for admission as an advanced student, and be enrolled, or eligible for enrollment, as a regular full-time graduate student.

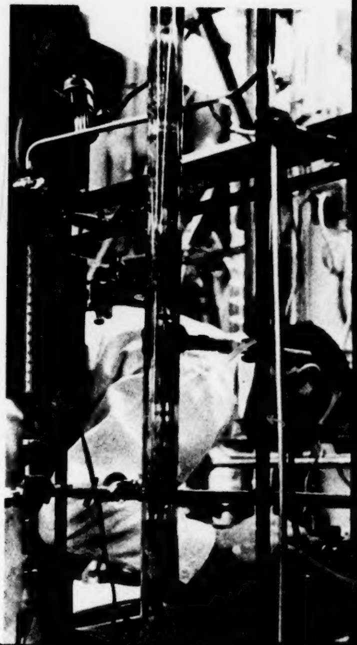
**3.** Be appointed on a full-time basis.

**4.** Be a citizen of the United States, or a non-citizen admitted to the United States for permanent residence. A non-citizen holding a temporary visa may be appointed with prior approval of the awarding unit.



Kettering laboratory at University of Cincinnati Institute of Environmental Health. Aerial view of a portion of University of Cincinnati campus.





## **University of Cincinnati** Cincinnati, Ohio

The University of Cincinnati offers a graduate training program in air pollution within two departments with the objective of providing a broad base of essential fundamental principles, a depth of knowledge in specialized fields, and research training under the guidance of experienced scientists and engineers. The student may elect to take his degree program in either the College of Medicine, Department of Environmental Health, or the College of Engineering, Division of Environmental Health Engineering. Under the auspices of the interdepartmental Center for the Study of the Human Environment, students receive the opportunity to participate in other programs such as Chemical Engineering, Water Pollution, Solid Waste Engineering, Chemistry, Community Planning, Geography. Different programs are available leading to the degrees of M.S. or Ph.D.

Available at the Department of Environmental Health are well-equipped laboratories for teaching and research in measuring and monitoring pollutants, toxicology, biological sciences, and environmental medicine, as well as library and computer facilities. Available at the Division of Environmental Health Engineering are chemical, microbiological, and pilot plant laboratories. New facilities include air pollution control laboratories.

Air Pollution related courses offered in this program include:

Air Pollution Chemistry
Air Pollution Control Methods
Community Air Pollution Control
Air Sampling and Analysis I, II
Automotive Air Pollution and Control
Biological Effects of Air Pollutants
Design of Air Pollution Control Systems
Instrumental Methods of Analysis
  of Air Pollutants
Design of Environmental Quality
  Monitoring Programs
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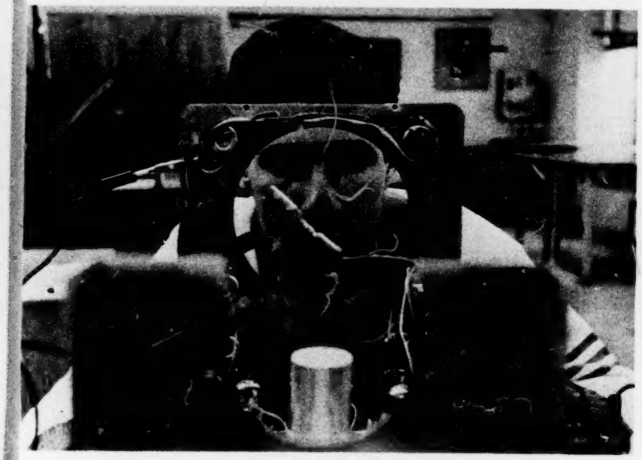

(above and lower left) Laboratory studies at Cooper Union.

## **Cooper Union** New York City, New York

The program at Cooper Union offers students in civil, mechanical, chemical and electrical engineering an M.S. degree. This M.S. study plans to produce professional engineers well versed in thermodynamics, mass transfer, and the fundamental properties and behavior of dilute particle-gas systems. The major emphasis is placed on the technical fundamentals with secondary emphasis on general air pollution control. This knowledge enables the student to develop exploratory designs for the control of atmospheric contaminants at their source.

Air pollution related courses offered in this program include:

Air Pollution Control Systems I and II
Aspects of Air Pollution I and II
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Air Pollution related courses offered in this program include:

- Air Pollution Chemistry
- Air Pollution Control Methods
- Community Air Pollution Control
- Air Sampling and Analysis I, II
- Automotive Air Pollution and Control
- Biological Effects of Air Pollutants
- Design of Air Pollution Control Systems
- Instrumental Methods of Analysis of Air Pollutants
- Design of Environmental Quality Monitoring Programs
- Air Pollution Meteorology
- Environmental Health Seminar
- Environmental Health and Community Planning
- Environmental Hygiene Technology
- Environmental Sanitation
- Epidemiology
- Fuels and Fuel Technology
- Industrial Ventilation
- Introduction to Biostatistics
- Introduction to Toxicology
- Physiology and Biological Chemistry
- Experimental Design
- Small Particle Technology
- Toxicologic Aspects of the Environment

For additional information, write to: Professor Bernard E. Saltzman, Department of Environmental Health, University of Cincinnati, Cincinnati, Ohio 45219; or to Professor John N. Pattison, Division of Environmental Health Engineering, University of Cincinnati, Cincinnati, Ohio 45221.

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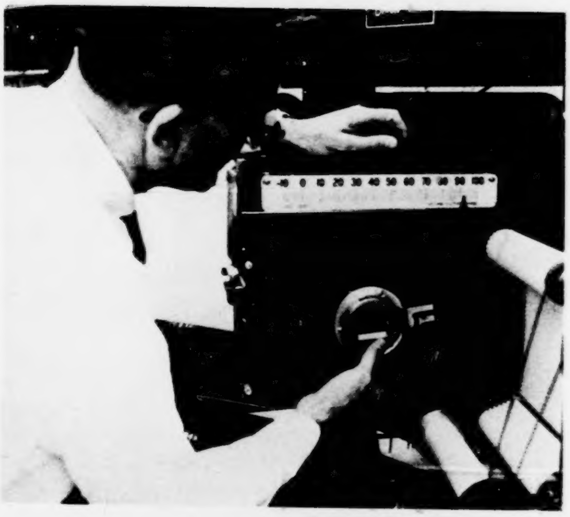
Air pollution related courses offered in this program include:

- Air Pollution Control Systems I and II
- Aspects of Air Pollution I and II
- Graduate Humanities Seminar
- Numerical Analysis
- Material Science
- Thermodynamic Behavior
- Transport Phenomena

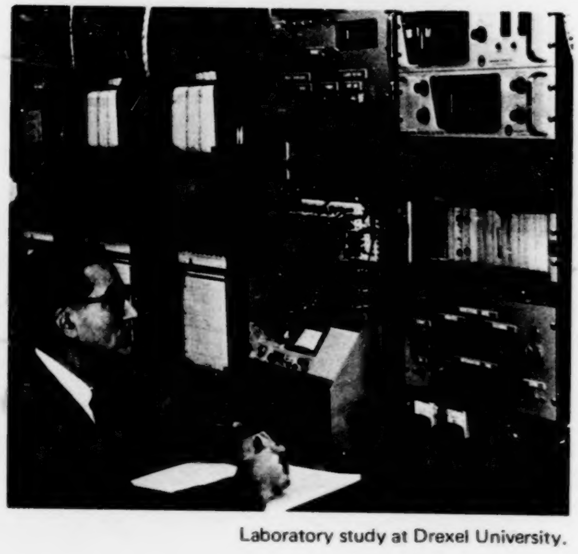
Six elective credits may be taken in engineering design from specialized courses in chemical, civil, mechanical or electrical engineering. Thesis work is oriented to exploratory design in air pollution control. For additional information, write to the Program Director: Dr. John L. Bove, Prof. of Chemistry, Cooper Union, 51 Astor Place, New York, New York 10003.

Physics project in laboratory at Drexel University.



Drexel University meteorologist

Meteorological equipment
used in field study at Drexel University.



Laboratory study at Drexel University.

**Drexel University** Philadelphia, Pennsylvania

The Air Resources Curriculum is a graduate program in Environmental Engineering and Science, and is one phase of "The Center for the Study of the Environment," which provides a broad base of training in physical and social environmental sciences, applicable to all areas of concern. The multidisciplinary program offers intensive specialized training in several specific areas: air resources, water resources, radiological health, occupational health, solid waste, food technology, and the socioeconomic effects of the environment. Air Resources was the first specialty course offered when the program was initiated in 1963, and the other courses have been added since.

The present Air Resources Curriculum (48 credits) leads to an M.S. degree in one year (four quarters); the fourth quarter is devoted to completion of a special project relating course work completed to real time exposure with air pollution problems of concern to local or state agencies and industries. A doctoral degree may also be obtained.

Air pollution related courses offered in this program include:

Air Pollution Control Processes
Air Pollution Distribution and Effect
Air Pollution Sources
Air Resources Management
Air Sampling and Analysis
Biostatistics
Combustion Theory
Environmental Chemistry
Environmental Health
Environmental Instrumentation
Environmental Physiology
Environmental Systems Analysis
Epidemiology
Fate of Pollutants
Human Factors Engineering
Incinerator Design
Industrial Location and Regional Development
Industrial Ventilation
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**University of Florida** Gainesville, Florida

The purpose of this program offered by the Department of Environmental Engineering is to provide advanced, specialized education for graduate engineers and scientists in air pollution control. The program is arranged individually for each student. In addition to specialized air pollution studies the student acquires a knowledge of the broad aspects of environmental engineering and an understanding of the principles and problems of related disciplines. To achieve this all students are required to participate in a departmental core program. Degree programs include the Doctor of Philosophy and the thesis and non-thesis Masters.

Ph.D. candidates attend the entire series of air pollution courses and do additional work in environmental engineering to complete the major portion of their program. In addition to his major, the student may select a minor in another discipline; however, this is not required in any of the degree programs. A dissertation based on original research is required.

Air pollution related courses offered in this program include:

Man and His Environment
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Air Pollution Control Processes
Air Pollution Distribution and Effect
Air Pollution Sources
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Air Sampling and Analysis
Biostatistics
Combustion Theory
Environmental Chemistry
Environmental Health
Environmental Instrumentation
Environmental Physiology
Environmental Systems Analysis
Epidemiology
Fate of Pollutants
Human Factors Engineering
Incinerator Design
Industrial Location and Regional Development
Industrial Ventilation
Odor and Taste
Meteorology
Meteorology of Air Pollution
Particle Dynamics
Public Health Administration
Radiobiology
Radiological Health
Solid Waste Systems
Stack Sampling Methods
Toxicology
Transport Processes
Urban Sociology
Water Resources Management
Operations Research

For additional information write to the Program Director: Dr. Henry C. Wohlers, Professor Environmental Science, Environmental Engineering and Sequence, Drexel University. 32nd and Chestnut Streets, Philadelphia Pennsylvania 19104.

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red by the Depart- g is to provide ad- graduate engineers rol. The program is dent. In addition to student acquires a f environmental en- the principles and To achieve this all in a departmental lude the Doctor of thesis Masters.

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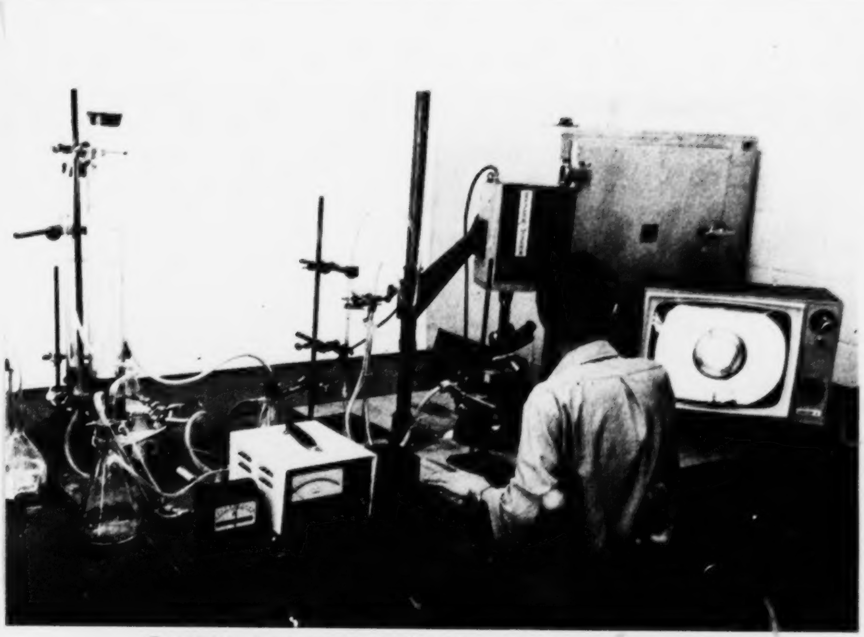
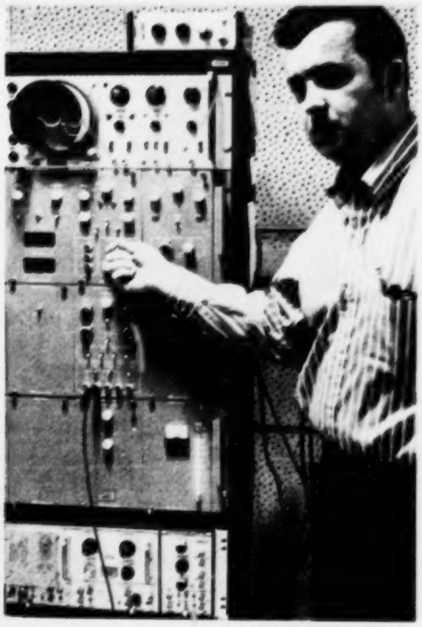
Air pollution related courses offered in this program include:

Man and His Environment
Occupational Health
Atmospheric Pollution
Environmental Instrumentation
Air Pollution Sampling and Analysis
Air Pollution Control
Meteorology
Environmental Micrometeorology

For additional information write to Program Director: Dr. Robert S. Sholtes, Air Pollution Research Laboratories, Department of Environmental Engineering, University of Florida, Gainesville, Florida 32601.



Dynamics of water vapor condensation about a crystal suspended on a filament is observed with the aid of microscopic magnification and closed-circuit television. The study seeks to establish the influence of pollution on natural atmospheric processes.



Neutron activation analysis being applied to determine the presence and concentration in the sub-microgram region of about 24 elements.

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## Georgia Institute of Technology Atlanta, Georgia

The Georgia Tech Graduate Air Quality Control Training Program is designed to prepare engineers and scientists for entry into the environmental control field. An interdisciplinary curriculum is offered to supplement graduate degree requirements in the established branches of engineering and science. Four general areas of instruction and research are stressed. These are:

- Emission control for industrial and power-generating processes
- Microanalysis and sampling of contaminants
- Atmospheric reactions, diffusion, and dispersion of pollutants
- Effects of pollutants on humans, animals, and plants

Requirements for the Master of Science degree are 33 credits plus thesis research in problems related to air pollution.

Air quality related courses offered in the program are:

- Aerosol Technology
- Industrial Emission Control
- Atmospheric Reactions
- Fine Particle Technology
- Analysis of Atmospheric Contaminants
- Air Pollution Biology
- Air Pollution Measurements and Control
- Engineering Aspects of Environmental Health
- Power Plant Engineering
- Combustion and Flames

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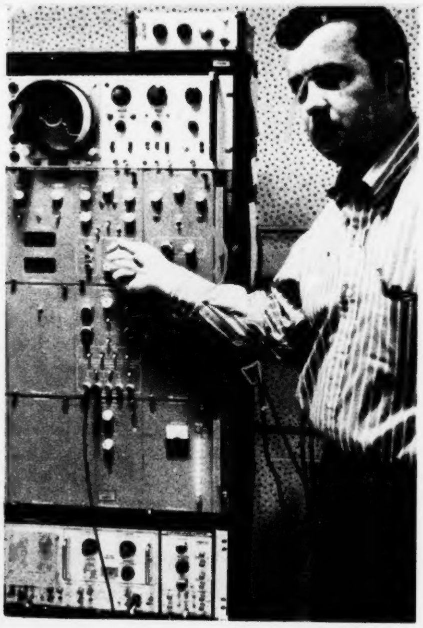

Neutron activation analysis being applied to determine the presence and concentration in the sub-microgram region of about 24 elements.

Particulate matter from a sample of 20 to 50 m$^3$ of air is being collected on a membrane filter from the roof of the Chemical Engineering Building. Analysis is by neutron activation.

**nology** Atlanta, Georgia

Air Quality Control
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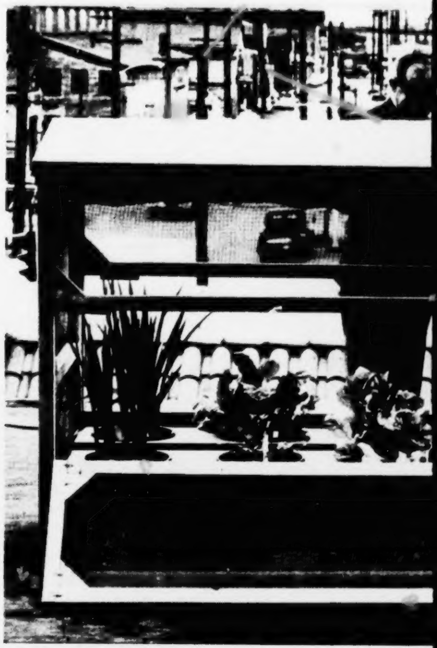
Analysis of Atmospheric Contaminants
Air Pollution Biology
Air Pollution Measurements and Control
Engineering Aspects of Environmental Health
Power Plant Engineering
Combustion and Flames

Research facilities at Georgia Tech include the Micromeritics Laboratory specializing in investigation of finely divided materials, surface chemistry and physics, nucleation and cloud behavior, aerosol generation and atomization; Analytical Instrumentation Laboratories featuring electron microscopy, X-ray diffraction and fluorescence, emission spectroscopy and infrared spectrophotometry; Aerobiology Laboratory with chambers for the study of airborne bacteria; Radioisotope Laboratory; Radiation Biology Laboratory; and the Nuclear Research Center.

For additional information, write to: Dr. Michael J. Matteson, School of Chemical Engineering, Georgia Institute of Technology, Atlanta, Georgia 30332.

Controlled atmosphere plant growth chambers used in studies of the effects of selected air pollutants on plant growth, yield, and metabolism.



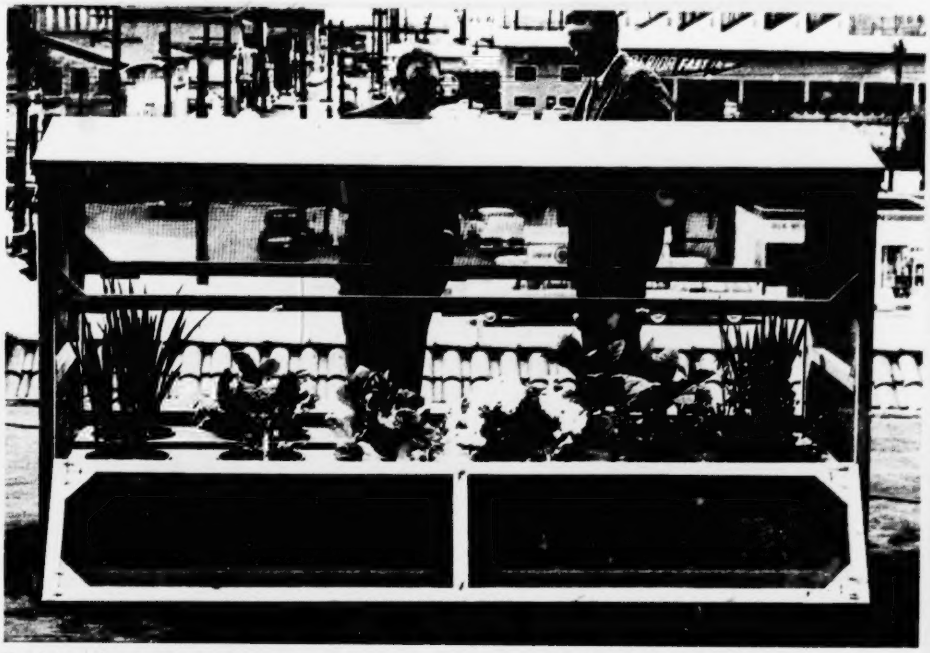
Study in urban location to show the usefulness of

of selected air pollutants.

(below right) Injection of sample into microcoulometric cell used to determine concentration of sulfur-containing gasses.

(far right) Smog-forming potential of terpenoid emanations from plant foliage determined under exposure to ultraviolet radiation.

rowth chambers used in studies of the effects of selected air
d, and metabolism.



Study in urban location to show the usefulness of selected species of vegetation as indicators of selected air pollutants.

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## **Harvard University** Cambridge, Massachusetts

The air pollution training program is offered by the staff of the Kresge Center for Environmental Health. This center is composed of the Departments of Environmental Health Sciences, Physiology, and Sanitary Engineering. Fundamental and applied research on the biological, physical, and chemical aspects of air pollution control play a major role in the activities of the center, and this is reflected in the training program. Through the cooperation of other Graduate Schools within the University, related courses are available on the planning, administrative and economic aspects of the subject.

Individuals specializing in air pollution control may pursue a program leading to the degrees of Master or Doctor of Science in Hygiene. Students receive intensive training in air pollution control, supplemented by a broad background in environmental health, including industrial hygiene, radiological health, and toxicology.

Since experience has shown that protection of the air environment requires trained personnel in a variety of basic disciplines, this program encourages the participation of engineers, physicians, and students holding degrees in chemistry, physics, mathematics, biology and pharmacy.

Harvard offers the following courses:

Community Air Pollution
Meteorological Aspects of Air Pollution
Instrumental Methods of
Environmental Analysis
Identification and Measurement
of Air Contaminants

Aerosol
Biostatis

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## **The Johns Hopkins University,** Baltimore, Maryland

The Johns Hopkins University offers a Master's program in air pollution control and a doctoral study program of the atmospheric environment. The programs are cooperative efforts of the departments of geography and environmental engineering and chemistry at the Homewood campus, and the department of environmental health and environmental medicine at the School of Hygiene and Public Health.

The one-year Master's program provides additional education for bachelors of the physical, biological, and engineering sciences who wish to apply their knowledge and capabilities to the challenging field of air pollution control. Students enroll for courses in statistics and in epidemiology, in addition to the following:

Air Pollution Control and Strategy
Air Pollution Control and Evaluation Laboratory
Biological and Physiological Effects of Air Pollution
Atmospheric Dispersion and Diffusion
Air Science and Management Seminar

Students may also select optional courses given by the chemistry, meteorology, and environmental medicine departments, and these additional program offerings:

Chemistry of Air Pollutants
Photochemistry
Aerosol physics
Aerosols, Airborne disease, and the
Respiratory tract

A master's essay which may be completed during the summer months is required. The subject should be a selected facet of the air pollution problem and must demonstrate the student's maturity and ability to synthesize ideas.

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health, including industrial hygiene, radiological health, and toxicology.

Since experience has shown that protection of the air environment requires trained personnel in a variety of basic disciplines, this program encourages the participation of engineers, physicians, and students holding degrees in chemistry, physics, mathematics, biology and pharmacy.

Harvard offers the following courses:

Community Air Pollution
Meteorological Aspects of Air Pollution
Instrumental Methods of
Environmental Analysis
Identification and Measurement
of Air Contaminants
Aerosol Technology
Biostatistics and Epidemiology

Basic Problems in Occupational Health
and Industrial Environments
Human Physiology
Principles of Toxicology
Environmental Control
Legal Aspects of Consumer and
Environmental Protection
Mathematical Modeling for Health Sciences
Operations Research in
Environmental Health Engineering

Further information may be obtained by contacting: Dr. Dade W. Moeller, Associate Director, Kresge Center for Environmental Health, Harvard School of Public Health, 665 Huntington Avenue, Boston, Massachusetts 02115.

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Biological and Physiological Effects of Air Pollution
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Chemistry of Air Pollutants
Photochemistry
Aerosol physics
Aerosols, Airborne disease, and the
Respiratory tract

A master's essay which may be completed during the summer months is required. The subject should be a selected facet of the air pollution problem and must demonstrate the student's maturity and ability to synthesize ideas.

A student seeking the Doctor of Philosophy degree may enroll in any department at the university. He may arrange any program of studies consonant with his own interests and capabilities that will enable him to conduct research on problems related to the study of the atmospheric environment. The University's requirements for the degree must be satisfied, however, including the submission of a dissertation describing an original research contribution.

For additional information write to the Program Director: Dr. Jerome Gavis, Department of Geography and Environmental Engineering, The Johns Hopkins University, Baltimore, Maryland 21218.

Mobile odor perception laboratory used to determine olfactory detection limits for pure chemicals and for mixtures of malodorous source gases.

## **University of Illinois** Urbana, Illinois

The curriculum in air resources offered at the University of Illinois at Urbana—Champaign provides specialized training, at the M.S. level for engineers and scientists who expect to be employed by Federal, State, or local governments, private industry, or with consulting firms involved in identifying and eliminating air pollution problems. The course offerings are also available to students in other academic programs. Supporting the course offerings is an active research effort related to air pollution problems. Studies that lead to a Ph.D. degree including course work and research work are also available.

Although the program involves primarily the Departments of Civil and Mechanical Engineering, the program is open to all engineering students as well as to chemistry and physics majors.

The M.S. program can be completed in 12 months and includes a thesis or special problem (depending upon the requirements of the candidate's major department). In addition, each candidate is required to spend from two to four weeks in a State or local control agency for on-the-job experience as part of the twelve-month M.S. program. All students are required to be knowledgeable of the subject matter listed below. A wide variety of supplemental courses is available in air resources as well as in other environmental areas.

Principles of Air and Water Chemistry
Engineering Applications of
Meteorological Fundamentals
Air Pollution Seminar
Air Resources Management
Control of Air Pollution
Analysis of Air Pollutants
Biology of Environmental Systems

For additional information, write to the Program Director: Dr. James J. Stukel, Assistant Professor of Mechanical and Civil Engineering, University of Illinois, Urbana, Illinois 61801.

## **University of Kentucky** Lexington, Kentucky

The objective of the Graduate Program in Air Pollution Control offered in the College of Engineering is to provide academic and research training leading to the M.S. and Ph.D. degrees. Engineers will be prepared to participate in virtually all phases of activities of Federal, State, and municipal agencies, health departments, and industrial or research establishments involved in the prevention and abatement of atmospheric pollution.

The requirements for the M.S. degree, which can be completed in 12 months, are: five 3–semester–hour core courses, three 3–hour courses selected from optional courses or from suitable elective courses, and an M.S. thesis that in certain cases, can be replaced by two additional courses. A seminar is scheduled one afternoon every 2 weeks to acquaint trainees with the latest developments in the field. M.S. degrees are awarded in chemical engineering, civil engineering, and mechanical engineering. Students with B.S. degrees in chemistry or physics are also eligible for the program.

Air pollution related courses offered in this program include:

Fundamentals I: Atmospheric chemistry and thermodynamics, micro-meteorological concepts, and turbulent diffusion.

Fundamentals II: Source control, gaseous and particulate pollutant separation, legal and administrative aspects.

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This tower and low-rise dormitories in the foreground are only one-half of the University of Kentucky's 22 million dollar residence hall complex.

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Air pollution related courses offered in this program include:

Fundamentals I: Atmospheric chemistry and thermodynamics, micro-meteorological concepts, and turbulent diffusion.

Fundamentals II: Source control, gaseous and particulate pollutant separation, legal and administrative aspects.

Engineering and Economics: Combustion principles, fuels, and emission and field sampling.

Air Sampling and Analysis: Statistics of sampling, analytical procedures, and laboratory determinations.

Public Health Aspects: Epidemiology and toxicology, effects on the environment, and solid waste disposal and water pollution interrelation.

For additional information, write to the Program Director: Dr. Robert B. Grieves, Professor and Chairman of Chemical Engineering, University of Kentucky, Lexington, Kentucky 40506.

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residence hall complex.

The University of Maryland conducts short courses in visible emissions evaluation to train smoke observers for plume evaluation and law enforcement, since the State of Maryland limits visible emissions from sources of air pollutants.

## **University of Maryland,** College Park, Maryland

The College of Engineering at the University of Maryland offers an interdisciplinary graduate study program in air pollution control leading to the degrees of Master of Science and Doctor of Philosophy.

Air quality conservation embraces so many disciplines and specializations that in-depth knowledge in all the areas of concern is difficult to obtain. This knowledge is essential, however, to those engineers, chemists, public health officials, and other specialists who are now being called upon to restore and conserve air quality. This program is directed to those who aspire to such responsibilities and places emphasis upon the engineering aspects of air resource management.

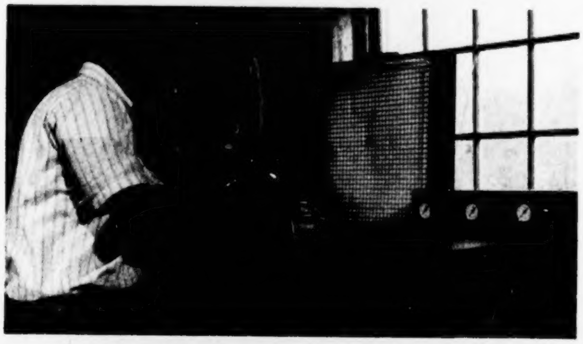
Qualified college graduates from all areas of engineering and science may enroll and work toward a degree in air pollution control through one of the three participating areas — chemical engineering, civil engineering, or meteorology. Core courses are:

Air Pollution
Air Sampling and Analysis
Seminar in Atmospheric Pollution
Meteorology of Air Pollution
Control of Air Pollution Sources
Air Pollution Biology

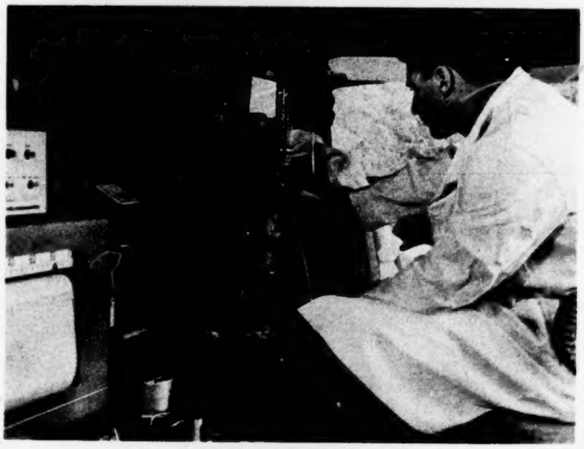
Other courses may be selected from the University curriculum to provide background and specialization of particular value to trainees seeking careers in air pollution control.

For additional information, write to the Program Director: Dr. Gerhard Israel, Assistant Professor in Meteorology and Civil Engineering, Department of Civil Engineering, University of Maryland, College Park, Maryland 20742.

Laboratory study at the University of Massachusetts of $SO_2$ removal by water scrubbing uses an unusual packing device.



University of Massachusetts graduate student using a chromatograph to analyze air samples.



## **University of Mas**
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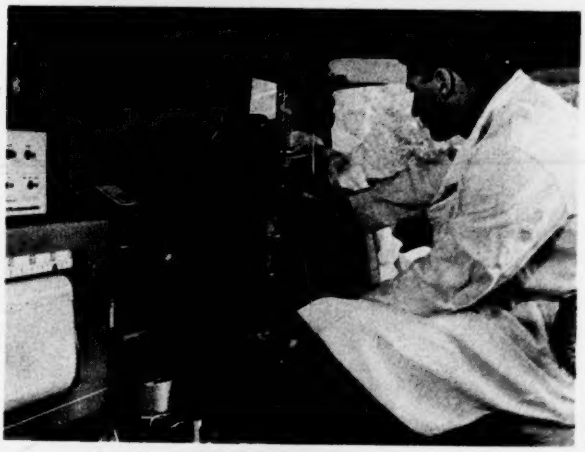
Laboratory study at the University of Massachusetts of $SO_2$ removal by water scrubbing uses an unusual packing device.

University of Massachusetts graduate student using a chromatograph to analyze air samples.



## University of Massachusetts

Amherst, Massachusetts

The University of Massachusetts offers an interdepartmental program leading to a Master's degree in chemical engineering, environmental engineering within the division of civil engineering, or public health. Air pollution training is offered within the framework of the professional objectives of each department. One calendar year Master of Science programs are offered by the Departments of Chemical and Civil engineering, (approximately 32 credits); a 2-year program (approximately 39 credits) is offered by the School of Public Health. Core courses for all program participants are:

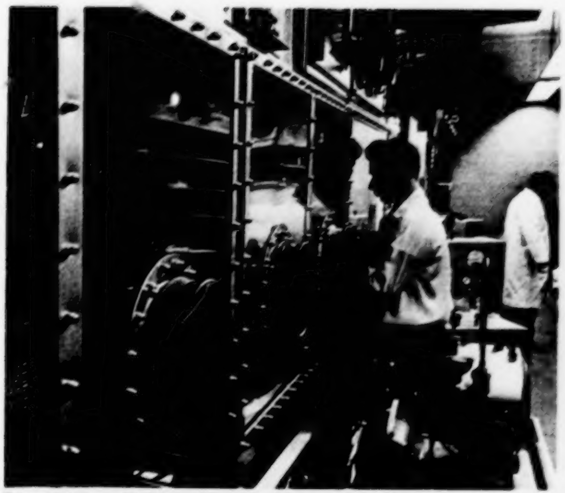
Air Pollution Control Processing
Micrometeorology
Air Sampling and Air Analysis
Introduction to Air Pollution
Air Pollution Seminar

The Department of Environmental Sciences offers a course in biological effects of air pollution and provides research opportunities in air pollution studies.

The balance of credits required for the Master's degree may be obtained from supporting departmental courses, by thesis, and/or by completion of special problem assignments.

For additional information, write to Program Directors: Dr. T. H. Feng, (Civil Engineering), Dr. D. D. Adrian (Civil Engineering), or Dr. H. A. Peters (Public Health, University of Massachusetts, Amherst, Massachusetts 01002.

The interior of one of the air pollution sampling trucks operated by researchers in the New York University School of Engineering and Science.



Generations of laboratory animals are born, live and die in these isolation chambers at the New York University Institute of Environmental Medicine, enabling researchers to study the effects of long term, low-level exposure to various types and combinations of air pollutants.

Graduate students in meteorology at the New York University School of Engineering and Science study the recorded trajectories of "tetroons", constant-altitude balloons flown over New York City in a New York University-United States Weather Bureau study of how air circulation patterns influence the movement, dispersion, and mixing of air pollutants over the Metropolitan area.

University of North Carolina professor demonstrating auxiliary equipment to graduate students.

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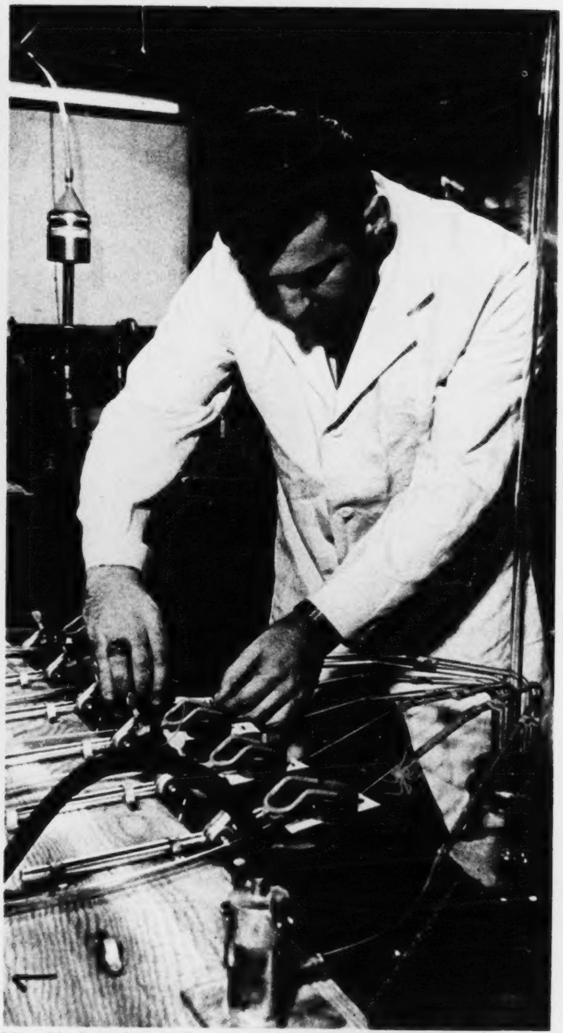
Graduate students in meteorology at the New York University School of Engineering and Science study the recorded trajectories of "tetroons", constant-altitude balloons flown over New York City in a New York University-United States Weather Bureau study of how air circulation patterns influence the movement, dispersion, and mixing of air pollutants over the Metropolitan area.



New York University's own extensive air pollution research program and the university's location in New York City make all advanced pollution research and control equipment available to graduate students in the NYU Air Resources Training Program.

## **University of Minnesota** Minneapolis, Minnesota

The Air Pollution Control Training Program of the Environmental Health Section of the School of Public Health has the following aims: (1) to increase the number of competent, well-trained engineers, chemists, and other scientists available for research and training in the technical aspects of air pollution and air pollution control; (2) to prepare selected individuals for service in air pollution control programs; (3) to indoctrinate students of different disciplines and from different departments of the university with the problems of air pollution in community life.

A candidate for the M.S. or M.P.H. degree in environmental health, with specialization in air pollution control, attends the core curriculum and elective courses suitable for his academic background.

The candidates for the Ph.D. degree are selected individuals who possess a suitable science background. In a minimum 3-year program, the trainee majors in environmental health and selects a minor program related to his previous academic training.

Air pollution related courses offered in this program include:

Elements of Public Health
Environmental Health
Epidemiology
Public Health Administration
Biometry
Environmental Biology
Environmental Health Seminar

Specialty courses offered for the M.S. or M.P.H. degree are:

Air Pollution Control
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## **New York University** New York, New York

The purpose of this program is to offer graduate students a coordinated interdepartmental program leading to the M.S. degree in either civil engineering, chemical engineering, or meteorology with a strong common minor in the field of air pollution. In this way it is intended not only to train students to participate in air pollution control and research programs, but also to increase their technical competence in the field of individual specialization.

The training course covers a full calendar year. Formal course work is taken in the fall and spring semester; the summer is devoted to thesis research or to participation in an existing on-campus research project and the writing of a research paper.

All Students are required to take the five courses listed below. The total requirement for the Master's degree is 36 units. Additional course electives, including research thesis or other departmental requisites for the degree, comprise the balance. The degree is granted by the Department which has academic jurisdiction over the student.

Air pollution related courses offered in this program include:

Air Pollution Analysis
Air Pollution Chemistry
Microclimate and Dispersion of Pollutants
Environmental Health Engineering
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## **esota** Minneapolis, Minnesota

ntrol Training Program of the Section of the School of Public ving aims: (1) to increase the , well-trained engineers, chemists available for research and cal aspects of air pollution and (2) to prepare selected individ- pollution control programs; (3) nts of different disciplines and nents of the university with the on in community life.

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the Ph.D. degree are selected sess a suitable science background. In a minimum 3-year program, the trainee majors in environmental health and selects a minor program related to his previous academic training.

Air pollution related courses offered in this program include:

Elements of Public Health
Environmental Health
Epidemiology
Public Health Administration
Biometry
Environmental Biology
Environmental Health Seminar

Specialty courses offered for the M.S. or M.P.H. degree are:

Air Pollution Control
Introduction to the Air Pollution Problem
Air Analysis
Air Pollution Projects
Topics in Air Pollution Control
Industrial Hygiene Engineering
Particle Technology
Air Pollution Meteorology

The curriculum for the Doctoral degree is designed to accommodate the academic background and desire of each student. Courses are available in all departments of the university.

For additional information, write to the Program Director: Dean Lee Stauffer or Professor Harold Paulus, School of Public Health, University of Minnesota, Minneapolis, Minnesota 55455.

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## **ty** New York, New York

ogram is to offer graduate stu- terdepartmental program lead- ee in either civil engineering, or meteorology with a strong field of air pollution. In this only to train students to parti- control and research programs, eir technical competence in the ialization.

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All Students are required to take the five courses listed below. The total requirement for the Master's degree is 36 units. Additional course electives, including research thesis or other departmental requisites for the degree, comprise the balance. The degree is granted by the Department which has academic jurisdiction over the student.

Air pollution related courses offered in this program include:

Air Pollution Analysis
Air Pollution Chemistry
Microclimate and Dispersion of Pollutants
Environmental Health Engineering
Air Pollution Engineering Control
Air Pollution Effects

Additional related courses are available in the Department of Aeronautics and Astronautics and the School of Environmental Medicine.

For additional information write to Program Director: Dr. James P. Friend, Associate Professor, Department of Meteorology and Oceanography, New York University, Bronx, New York 10453.

A pioneering air pollution wind tunnel at the New York University School of Engineering and Science. Elaborate scale model tests in this tunnel have solved scores of atmospheric pollution problems and led to advances in pollution research and control technology.

Plastic balloon used for the study of pho
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Participants from Japan, Germany, Italy, U
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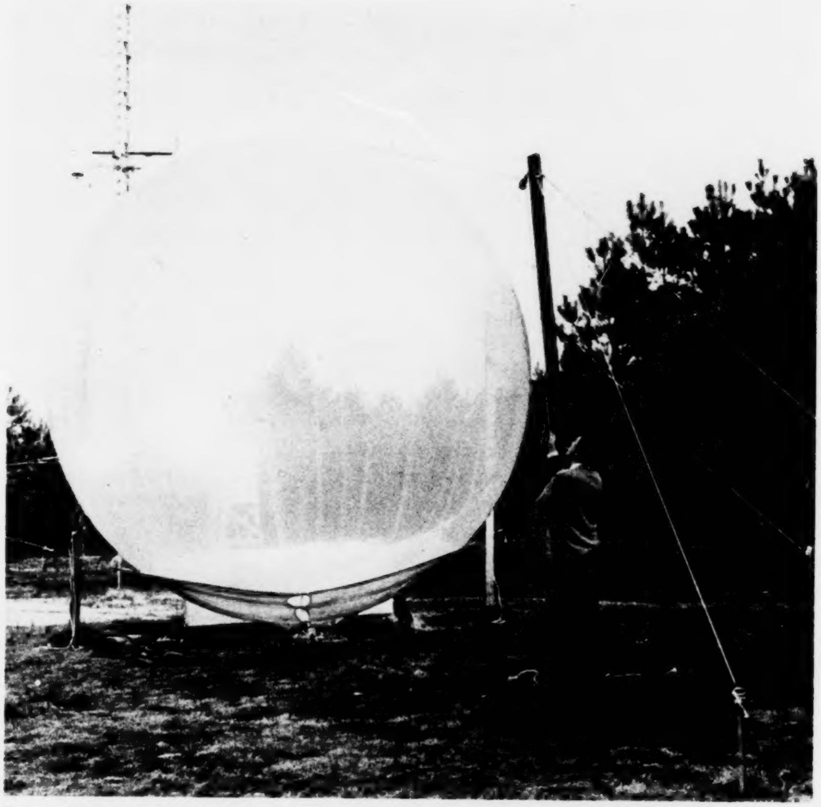
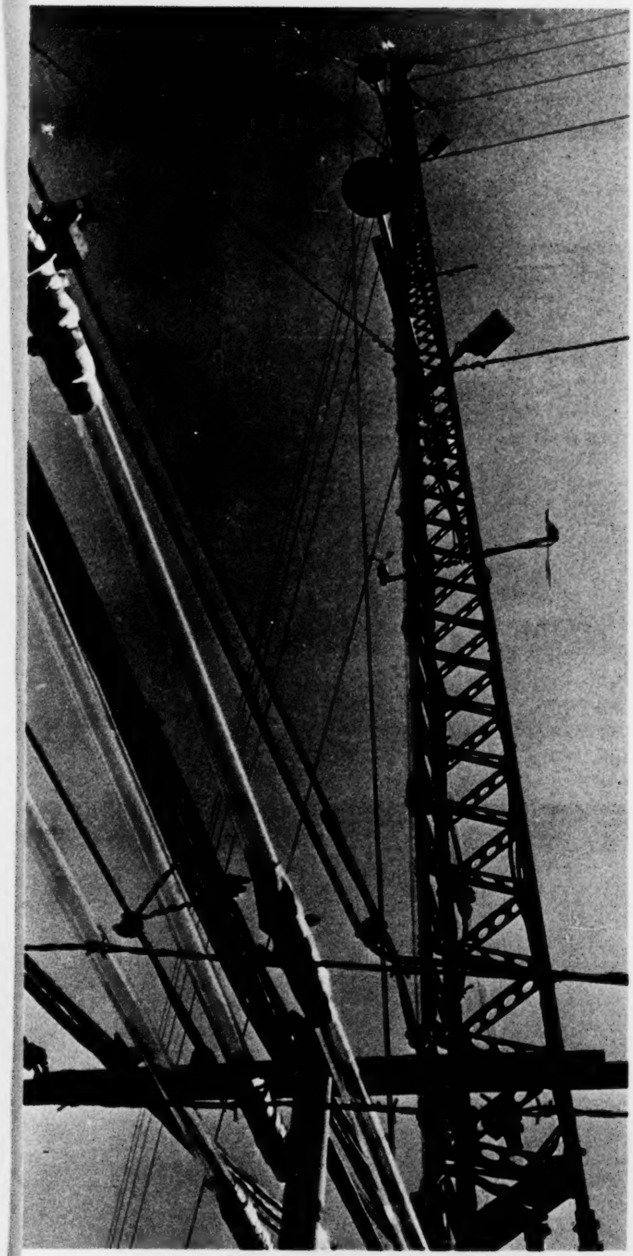


Plastic balloon used for the study of photochemistry of ambient air at the University of North Carolina.

Participants from Japan, Germany, Italy, United Kingdom and the Netherlands attend the UNC symposium on "Multiple Source Urban Diffusion Modeling".



Tower, at the University of North Carolina, instrumented for meteorological measurements and collection of air samples.

## **University of North Carolina** Chapel Hill, North Carolina

Air pollution training at the University of North Carolina at Chapel Hill is in the Air and Industrial Hygiene Program of the Department of Environmental Sciences and Engineering of the School of Public Health. The Department has a regular faculty of 30 and an enrollment of over 100 students; additionally, programs are offered in Sanitary Engineering and Water Resources, Environmental Chemistry and Biology, Environmental Management and Protection, and Radiological Hygiene.

The Air and Industrial Hygiene Program is now in its twelfth year. It offers courses in both air pollution and industrial hygiene, leading to the Ph.D., M.S., M.S.P.H. and M.S.E.E. (Environmental Engineering) degrees. The Program had a 1970 enrollment of 21 graduate students and a regular faculty of five professors. Masters degree students may elect a one-year general air pollution program, or a two-year receptor, source, or system-oriented program. The receptor-oriented program emphasizes air pollution measurement, transport, and effects, and stresses courses in the biological and physical sciences. The source-oriented program emphasizes air pollution sources and their engineering and legal control, and stresses courses in engineering. The system-oriented program looks at the entire air pollution system and stresses courses in city and regional planning, social sciences, and systems analysis.

The Chapel Hill campus is 15 minutes from Research Triangle Park, which contains the National Environmental Research Center, the National Institute of Environmental Health Sciences, and the Research Triangle Institute.

The University of North Carolina at Chapel Hill is a member of the Triangle Universities Consortium on Air Pollution; the other members are Duke University at Durham and North Carolina State University at Raleigh. Students in the Air and Industrial Hygiene Program at Chapel Hill may take courses at Duke and N.C.S.U., as
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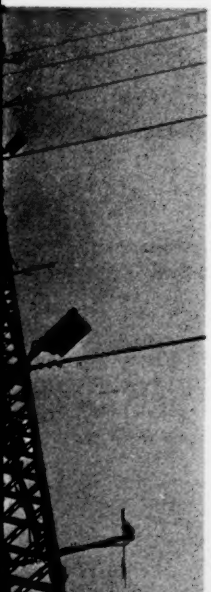

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For detailed curricula and additional information, write to: Professor Arthur C. Stern, Department of Environmental Sciences and Engineering, School of Public Health, University of North Carolina, Chapel Hill, North Carolina 27514.

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## **Oregon State University** Corvallis, Oregon

This program provides academic and research training for the M.S. and Ph.D. degrees to prepare engineers and scientists for professional careers in atmospheric pollution control in public and private agencies and industries concerned with solving air pollution problems.

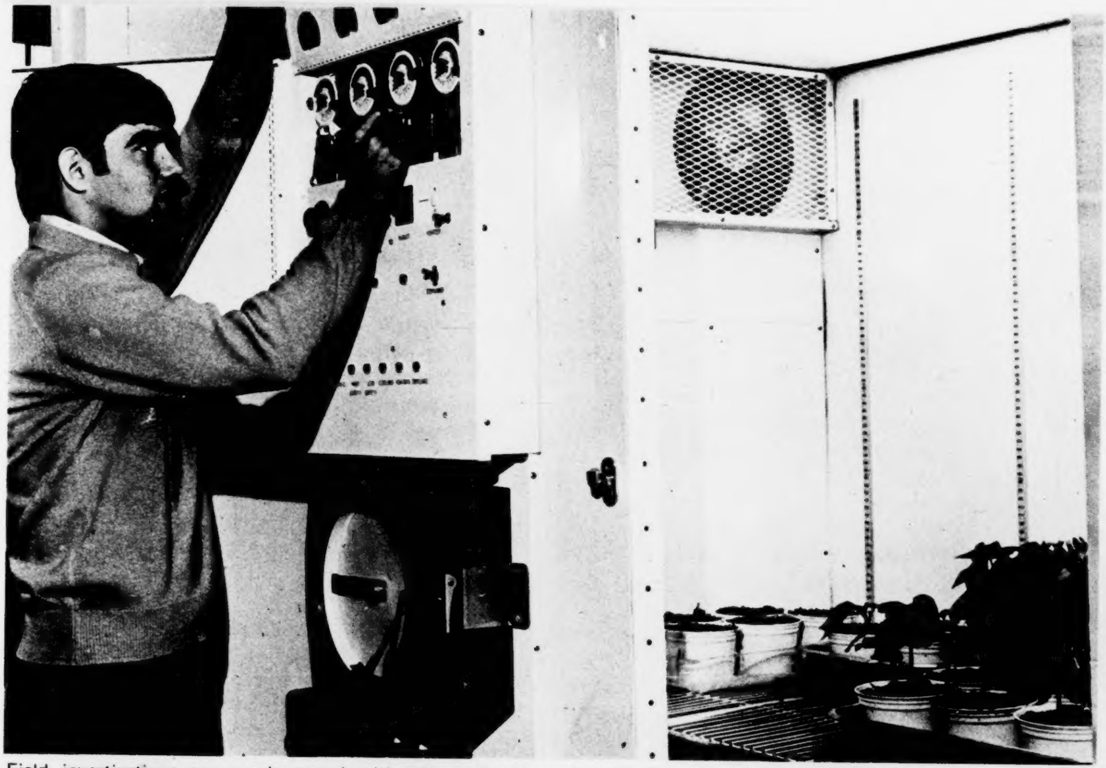
Requirements for the M.S. degree are 30 hours in the major field and 15 hours in the minor. For the Ph.D. degree, approximately 135 hours are required, of which 80 are in the major and 30 to 50 are allotted to the thesis.

Individual programs are adjusted to fit the student's interests and needs.

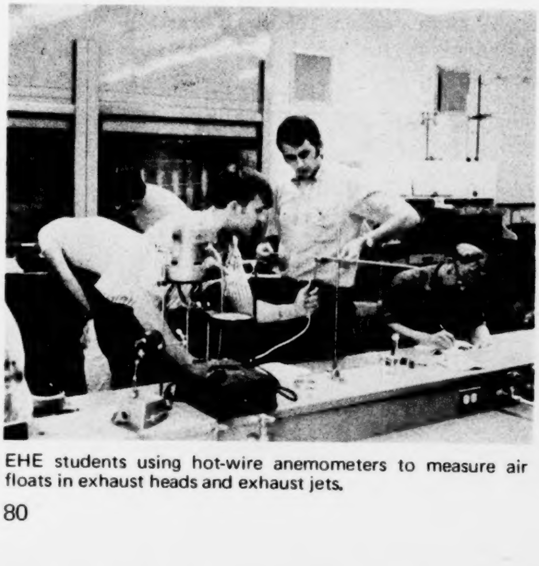
Air pollution related courses offered in this program include:

Fundamentals of Air Sanitation
Measurement and Control of Air Pollutants
Industrial Hygiene
Seminar on Atmospheric Environment
Thesis

For additional information write to the Program Director: Dr. Richard W. Boubel, Professor of Mechanical Engineering, Oregon State University, Corvallis, Oregon 97331.



Field investigations are supplemented with laboratory research to evaluate economic loss from air pollution. A Penn State graduate trainee prepares an experiment at the Center for Air Environment Studies' Phytotoxicology Laboratories to determine recovery capabilities of plants following acute exposures to pollutants.



EHE students using hot-wire anemometers to measure air floats in exhaust heads and exhaust jets.

University of Texas professor instructs students in use of anemometer readouts to determine atmospheric turbulence parameters.

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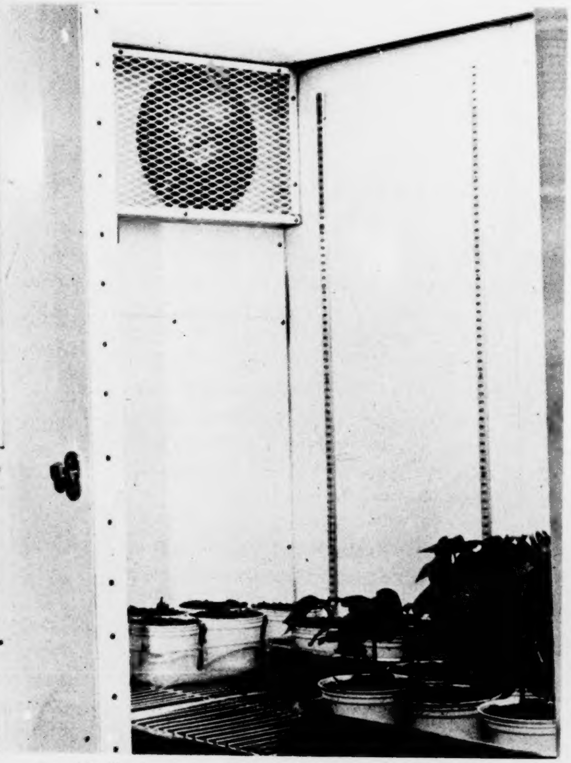

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University of Texas professor instructs students in use of anemometer readouts to determine atmospheric turbulence parameters.

A project demonstration at the University of Pittsburgh.

## University of Pittsburgh
Pittsburgh, Pennsylvania

The three major purposes of the air pollution training program in the School of Public Health are (1) to develop practitioners in the field of air pollution control for positions in government and industry, (2) to develop high caliber researchers in aerosol physics, and (3) to make air pollution courses available to candidates in other programs.

In cooperation with the Graduate School of Engineering and the Division of Natural Sciences, an interdepartmental, interschool program has been developed for students working toward degrees in chemical engineering, civil engineering, or chemistry. In these programs, the student enrolls in air pollution courses in addition to the courses pertinent to his major field of study.

Requirements for the Master of Science degree are 36 to 38 credits. In addition to the air pollution courses listed below, degree programs include courses in biostatistics, epidemiology, physiology, and toxicology.

Air pollution related courses offered in this program include:

Water and Air Chemistry
Principles and Laboratory
Air Pollution Principles
Air Pollution Measurements
Properties of Dusts, Smokes, and Mists
Air Pollution Practice

For additional information write to the Program Director: Dr. Morton Corn, Professor of Industrial Health and Air Engineering, Graduate School of Public Health, University of Pittsburgh, 130 DeSoto Street, Pittsburgh, Pennsylvania 15213.

## Pennsylvania State University
University Park, Pennsylvania

The Graduate Air Pollution Training Program in the Center for Air Environment Studies is a coordinated intercollege program leading to the Master's degree.

In this program the students fulfill the requirements of an academic or professional degree program in a particular department while attaining special competence in air pollution by doing thesis research, by following a minor course sequence, and by participating in the interdisciplinary activities of the Center. Of the nine credits required in air pollution related courses, six credits must be taken outside the major field. Thesis problems in air pollution may be either of the traditional academic research nature or may involve a substantial and difficult system of program design.

Graduates of this program are prepared to pursue careers in government, industry, education, and other professional activities requiring advanced professional

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## Pennsylvania State University

University Park, Pennsylvania

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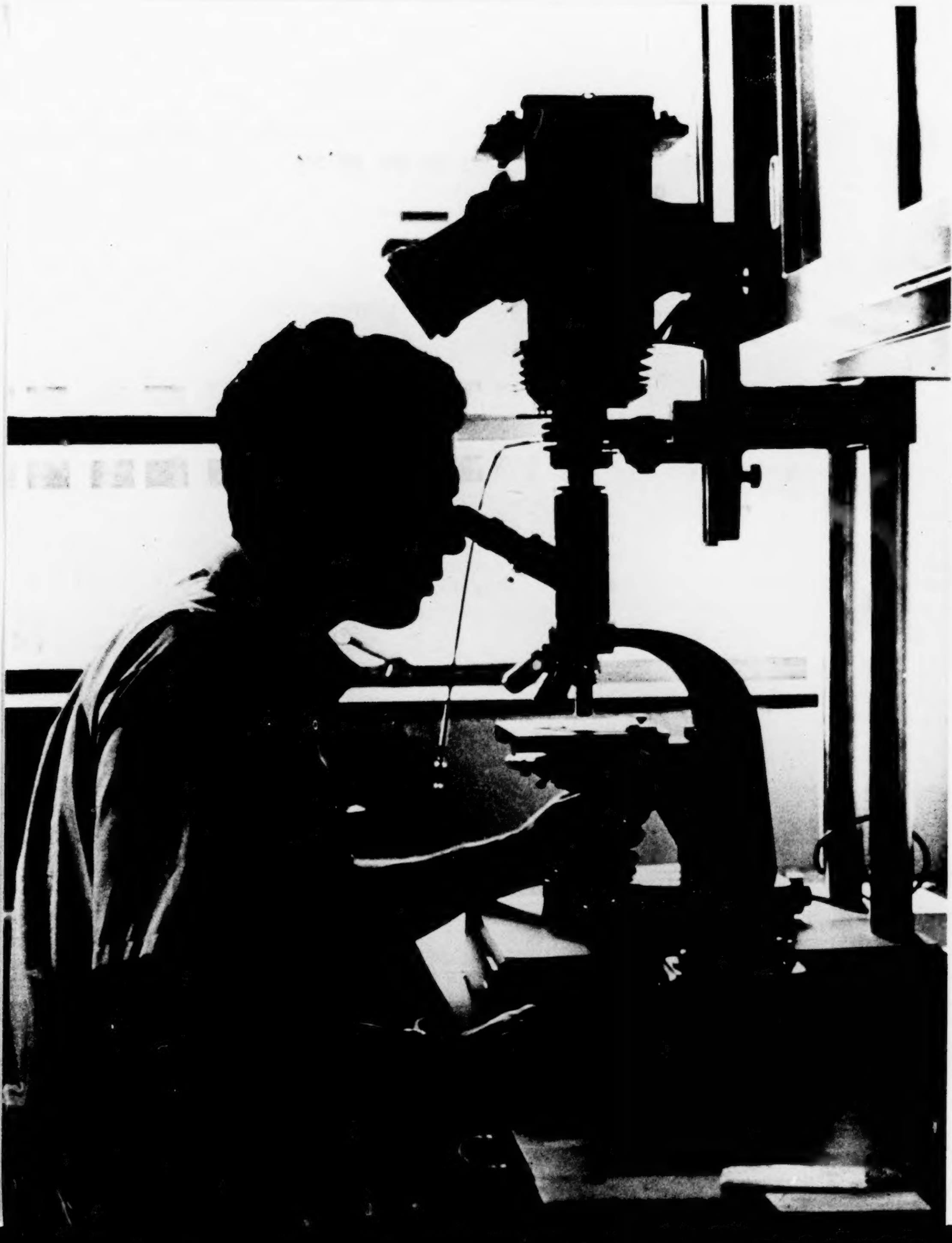
Graduates of this program are prepared to pursue careers in government, industry, education, and other professional activities requiring advanced professional training in a discipline coupled with training and research of the air pollution problem.

Air pollution related courses in this program include:

Introduction to Air Pollution Control
Air Pollution Seminar
Small Particle Technology
Gas Phase Reactions
Atmosphere Chemistry
Environmental Health
Environmental Pathology
Respiratory Physiology
Introduction to Micrometeorology
Atmospheric Diffusion

For additional information, write to the Program Director: Dr. William J. Moroz, Center for Air Environment Studies, 226 Chemical Engineering Building II, University Park, Pennsylvania 16802.

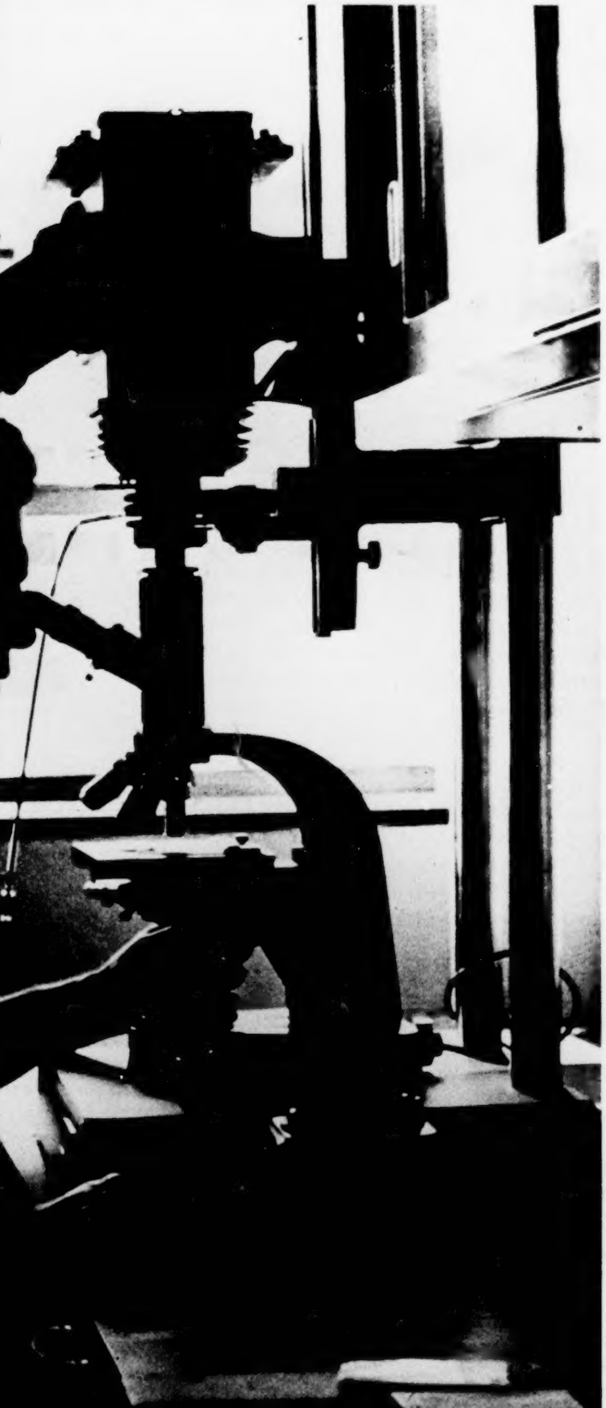
Penn State graduate trainees, at the Center for Air Environment Studies' Physiology Laboratories, prepare animals for a long term exposure to pollutants commonly found in urban air.



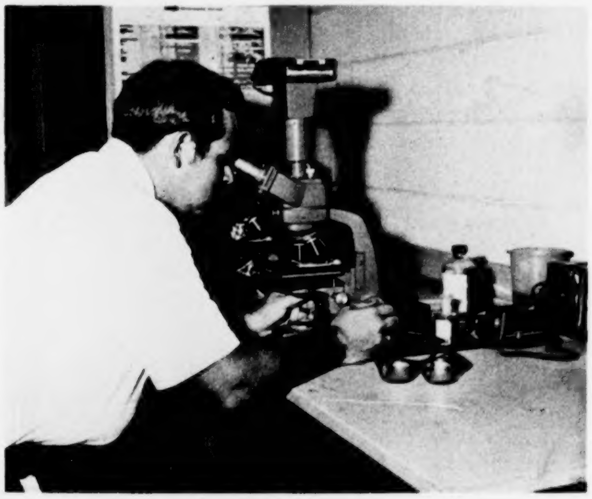
Faculty member
precipitator samp

Purdue University
matter collected b

(left) Microscopic
structure of a part

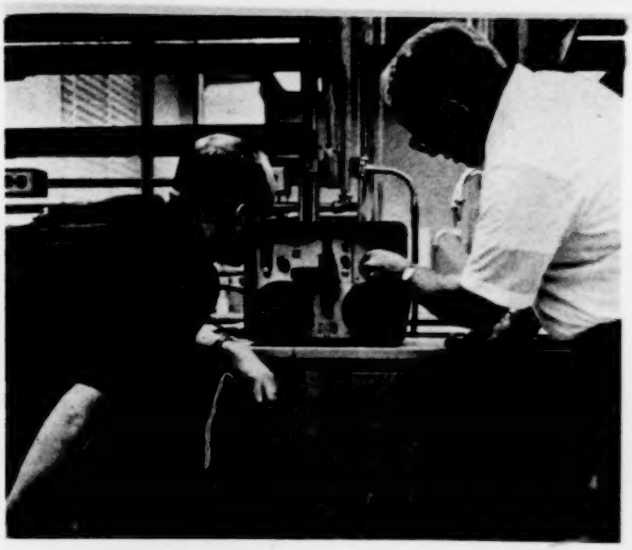


Faculty member explains the operating principles of an electrostatic precipitator sampler to Purdue University students.



Purdue University student uses microscope to examine particulate matter collected by "Rota-Rod" sampler.

(left) Microscopic study, as an aid in air pollution abatement, of the structure of a particle reveals their possible origin.



Students at Purdue University check-out tape sampler before putting it into operation at the environmental monitoring station on campus.

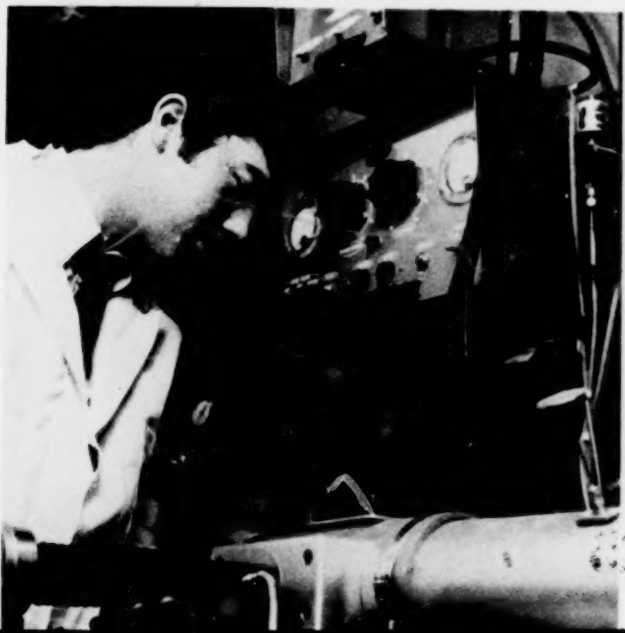
## **Purdue University** Lafayette, Indiana

The interdisciplinary graduate program at Purdue University provides specialists training to students pursuing careers in air pollution control. Supplemental training is offered to trainees in allied fields who will impinge on the overall environmental problems of man. The integrated training and fundamental research activities provide opportunities to participate in many areas of air pollution control. In all cases, the specific plan of study is tailored to the student's needs and desires. Master of science and doctor of philosophy degrees are offered.

Air pollution related courses offered in this program include:

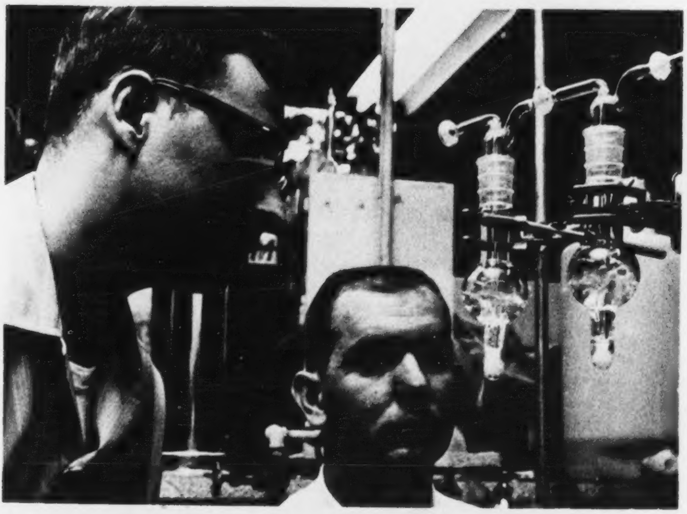
Air Pollution and Its Effects
Air Sampling, Analysis, and Instrumentation
Air Pollution Technology and Control Theory
Chemical Kinetics of Pollutants
Theoretical and Applied Meteorology
Microclimatology
Biometeorology
Chemical Analyses in Environmental Engineering
Systems Design and Application to
Natural Resources
Environmental Toxicology

For additional information write to the program coordinator: Dr. David L. Brenchley, School of Civil Engineering, Purdue University, Lafayette, Indiana 47907



West Virginia University graduate student is adjusting his self-machined nonconsumable electrode holder. This is part of a system he himself designed to produce large quantities of dry metal oxide particles for use in research on control equipment, respiratory disease, and vegetation injury.

Instructor, right, demonstrates apparatus for study of air pollution to two students in training program for air pollution technicians operated by the Pennsylvania State University.



Smog Bubbler apparatus, used for air pollution studies, is checked by two students participating in training program at The Pennsylvania State University Center for Air Environment Studies.

## **The University of Texas at Austin** Austin, Texas

The graduate program in air pollution control is designed to provide the student with the highest quality of engineering, scientific, and technological education. The objective of this program is to provide a basis for the individual student to understand, identify, and develop practical solutions to the engineering-related problems associated with the prevention and abatement of atmospheric pollution. Graduate studies in air pollution control at The University of Texas are part of the Environmental Health Engineering Program, which also encompasses water resources, water pollution control, radiological health, industrial hygiene, and solid waste management.

The course of study leading to the degree of Master of Science is designed to provide engineers and scientists with necessary information required for positions of responsibility with Federal, State, and local air pollution control agencies, consulting engineers, and industry. The program leading to the Ph.D. degree is recommended for those individuals who plan to conduct basic research leading to solutions of some of the problems of air pollution identification and control. This program also prepares the individual for positions of responsibility with governmental agencies, consulting engineers, and industry as well as to teach college-level courses dealing with air pollution control.

The program of study at The University of Texas consists of formal courses, directed reading seminars, and a research project on which a thesis dealing with some aspect of air pollution control may be based. I addition to a thesis, the three basic core courses r quired of all M.S. students are:

Air Pollution Surveys and Analysis
Air Control Equipment Design
Unit Operations and Air Cleaning
(laboratory)

The remaining 15 hours required to complete th 30 hour curriculum are selected based on the need interests, and future goals of the student. The course dealing directly with air pollution problems includ

Air Pollution and Industrial Hygiene
Industrial Toxicology
Air and Water Analysis
Physics of the Atmosphere
Microclimatology

Special courses include:
Particle Technology
Photochemistry and Gas Kinetics
Theoretical Approaches to
Air Pollution Control

The Ph.D. program of work is flexible and is gene ally tailored to meet the needs, interests, and goals c the individual student. For additional informatior write directly to: Dr. Patrick R. Atkins, ELB 30 The University of Texas at Austin, Austin, Texa 78712.

(above left) University of Texas professor explains anemometer readout data.

(left) EHE students using gas analyzer to determine the composition of automobile exhaust.

Field team takes samples from a veneer dryer stack to determine the chemical and physical characteristics of the emissions.

Aircraft specially equipped for realtime measurement
tions and meteorological factors in flight over U. S. For

**Washington State University** Pullman, Washington

Washington State University offers a multidisciplinary air pollution graduate program for students seeking the M.S. degree. The objective of this flexible program is to develop the student's ability to deal actively with air pollution problems in industry and control agencies. The program is sponsored by the Department of Civil Engineering in cooperation with the University's Environmental Science Program. The curricula are individually planned for graduates in engineering, agriculture, natural or physical sciences, as well as economics, business administration, and government. For engineers, studies will emphasize control technology.

Students may either work toward the Master of Science degree in Sanitary Engineering or Environmental Science or enroll in selected air pollution courses while working toward the M.S. degree in a wide range of cooperating major fields of study. In this latter curriculum, the student enrolls in courses pertinent to his major field of study and selected air pollution courses. Requirements for the M.S. degree, which can be completed in 12 months, include 24 semester hours of course work plus a thesis or 32 hours of course work.

The air pollution option is based upon five core courses totaling 11 hours, and a weekly seminar which are:

Fundamentals of Air Pollution
Air Pollution Measurement Techniques
Air Pollution Meteorology
Air Pollution Abatement and Administration
Air Pollution Control Engineering
Environmental Science Seminar

A minimum of 11 additional hours of study will be selected from suitable electives such as:

Statistical Methods
Processing of Scientific Information
Information Structures
Modeling and Simulation of Biological Systems
Public Administration
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Air Pollution Control Engineering
Environmental Science Seminar

A minimum of 11 additional hours of study will be selected from suitable electives such as:

Statistical Methods
Processing of Scientific Information
Information Structures
Modeling and Simulation of Biological Systems
Public Administration
Administrative Law and Regulations
Autecology
Synecology
Industrial Instruments
Resource Economics

Well-equipped air pollution laboratories are available for specialized study and research in odor perception, airborne real-time measurements of pollutant dispersion, atmospheric photochemistry, fluorine phytotoxicity, sulfur-containing gases, and instrumental analysis. The present five-member faculty combines 67 years of industrial research and academic experience in air pollution and closely allied fields. The University also has available supporting facilities including an IBM 360 Model 67 computer, four electron microscopes, and a 1-megawatt nuclear reactor.

For additional information, write to the Program Director: Professor Donald F. Adams, Air Pollution Research, Dana Hall, College of Engineering, Washington State University, Pullman, Washington 99163.

Chemist installs tape in aircraft magnetic tape data recorder.

Interior of mobile trailer laboratory, used to determine air pollution concentrations at selected field sites.

## **West Virginia University** Morganton, West Virginia

The purpose of this program, centered in the Department of Civil Engineering, is to give students a technical background in air pollution and its control. It is to be used as a foundation for obtaining concerted action directed at preventive protection and qualitative improvement of the environment. Methods stressed include the prevention of air pollution, development of better public health practices, community planning, conservation of natural resources, and comprehensive planned industrial development.

The Master of Science degree programs may be completed in three ways: 24 hours minimum course work and a research thesis, 30 hours minimum course work and a project or problem report, 36 hours minimum course work.

Chemical, civil, electrical, industrial, and mechanical engineering graduates may emphasize air pollution control for a Master of Science degree in their field, or a Master of Science in Engineering, undesignated. A limited number of graduates from other fields are also able to take strong minors in air pollution control with stipend support. To date, these have included political science and economics majors. Several chemists and physicists with degrees have shifted to engineering, with added course work to make up deficiencies.

Ph.D. programs are available within the College of Engineering in which air pollution control is the major emphasis. Air pollution related courses include:

Properties of Air Pollutants
Air Pollution Control Engineering
Air Pollution Control Standards
Air Pollution Control Programs
Complex Organizations
Waste Water Treatment
Urban Planning
Public Administration
Meteorological Dispersion and Diffusion

Key courses are taught by faculty who have had

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## **University of Washington** Seattle, Washington

The air resources program is designed to provide specialized training in air resources engineering for engineering candidates, seeking the M.S. degree, who expect to join air pollution control programs in Federal, state or local governments, private industry, or consulting firms. It is also designed for study and research leading to the Ph.D. degree.

The program is sponsored by the Department of Civil Engineering with the cooperation of the Department of Atmospheric Sciences. Supplemental courses are available from other engineering disciplines, health sciences, social and political sciences, and public administration.

The M.S. degree program (one year) requires a thesis. Requirements for the Doctorate include a program of study and research acceptable to the candidate's advisor and a supervisory committee. A dissertation that is a significant contribution to air pollution knowledge and a general examination in air resources in a minor supporting field are also required.

Air pollution related courses offered in this program include:

Air Resources Engineering I, II
Air Resources Management

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Properties of Air Pollutants
Air Pollution Control Engineering
Air Pollution Control Standards
Air Pollution Control Programs
Complex Organizations
Waste Water Treatment
Urban Planning
Public Administration
Meteorological Dispersion and Diffusion

Key courses are taught by faculty who have had extensive experience with industries and in governmental air pollution control agencies. Graduates will be accepted from civil, chemical, electrical, industrial and mechanical engineering, chemistry, physics, and other sciences. A limited number of graduates with degrees in other fields are accepted into the program with full financial support.

The complex terrain of the lovely West Virginia hills features the chemical process industries, metallurgical industries, extractive minerals mining, and fossil fuel electricity generating plants. These, together with small and medium-sized cities and other industries, make West Virginia University an excellent place for air pollution contrology, controllation, and related studies.

For additional information, write to the Program Director: Professor Benjamin Linsky, P.E., Department of Civil Engineering, College of Engineering, West Virginia University, Morgantown, West Virginia 26506.

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Air pollution related courses offered in this program include:

Air Resources Engineering I, II
Air Resources Management
Topics in Environmental Health Engineering
Air Conditioning (Industrial Ventilation
and Gas Cleaning)
Chemistry of Air Pollution
Aerosol Science and Technology I, II

For additional information write to the Program Director: Dr. August T. Rossano, Jr., Research Professor, Department of Civil Engineering, College of Engineering, University of Washington, Seattle, Washington 98105.

Graduate students take air pollution samples, from a coal-fired heating plant at West Virginia University, under normal test conditions. Another part of this class assignment was to measure the undesirable effects on a nearby building site.

Graduate students in air pollution control at West Virginia University's College of Engineering have to master many trades. In this experiment the student is producing a special mixture of air pollutants to which various manufactured articles will be exposed. The results will be used in the development of standards of acceptability for soiled surfaces. The bottles are taped as a safety measure.

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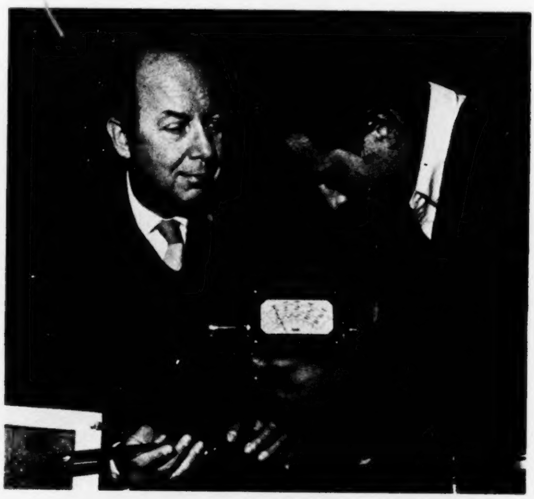

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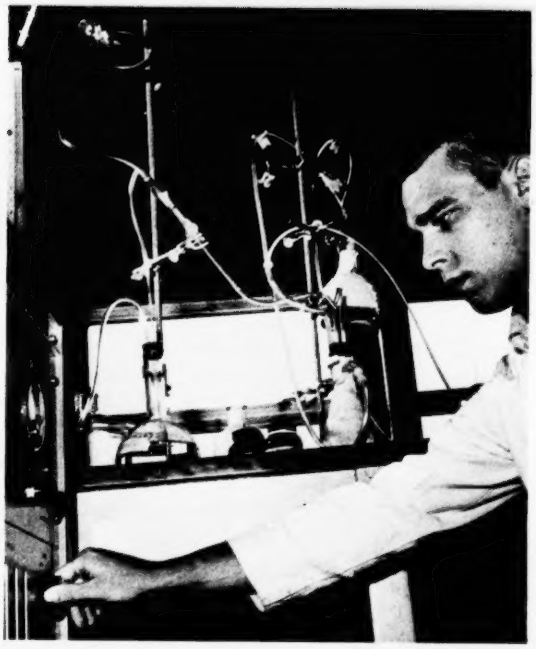

Special equipment had to be developed to count and determine the sizes of small droplets and bits of dust. This instrument is being used at West Virginia University's College of Engineering both in research and in training air pollution control engineering specialists. The bottles are taped as a safety measure.

Sucking out a match (left picture) isn't the same thing as blowing out one. This fundamental principle of the flow of air is explained at West Virginia University's College of Engineering to a graduate student, as he does his best to suck out the flame. Although the air velocities generated at your lips by sucking and blowing are about the same, the results are vastly different a few inches away. An understanding of this principle is essential for designing dust and gas traps to prevent air pollution. (right picture) Demonstrates the same principle with an air velocity meter and a high-volume air sampler.

## **University of Southern California** Los Angeles, California

This 3 month program is designed to train air pollution control administrators and is sufficiently flexible, in scope and depth, to produce a working understanding of the administrative aspects of air pollution control concepts and operations. In addition, a review of the engineering, physical sciences, and biological-medical elements provides an appreciation of the technical components related to air pollution control.

Each program includes workshops based on four core courses, plus one weekly seminar at the university, coupled with field investigations and study visits to industries, laboratories, and other operation and research agencies. Specifically, field training includes investigation of complaints, laboratory analysis of contaminant samples, and the evaluation of pollution control systems.

Seminar and field exercises are integrated throughout the program to allow comparison of theory and practice and to promote comprehension of the interrelationships between administration and technology. In addition to lectures, discussions, and field exercises; learning techniques include a computer-based management simulation exercise (Apex), decision-making games, and role-playing and case-study analysis. In lieu of a dissertation, qualified applicants can earn up to 12 hours of graduate credit toward a graduate degree in public administration.

Institutes are held three times each year as follows:

March – May
July – September
November – January

For additional information, write to the Program Director: Miss Gloria G. Barbaro, Air Pollution Control Institute, University of Southern California, Civic Center Campus, 311 South Spring Street, Los Angeles, California 90012.

(right) Associate degree students in Air Pollution Control Technology at Penn State learn to repair, calibrate, install, and operate various types of air sampling and monitoring equipment.

(far right) An air pollution technician uses his specialized training to aid in the development of a prototype dust monitoring instrument in the Aerosol Labs of the Center for Air Environment Studies at The Pennsylvania State University.

Los Angeles, California

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# Specialists Training Programs

*GENERAL INFORMATION*

*There are presently ten programs oriented to various academic levels designed to train air pollution control specialists. The areas stressed in these programs range from the administrative to the technical aspects of air pollution control.*

*Application for financial assistance in any of the following programs should be sent directly to the program director of the specialists program.*

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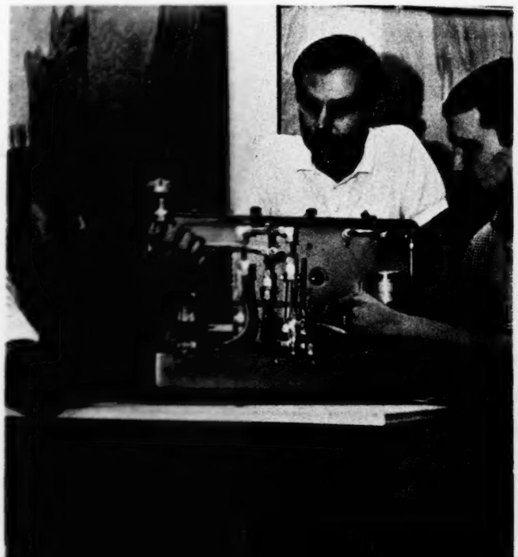
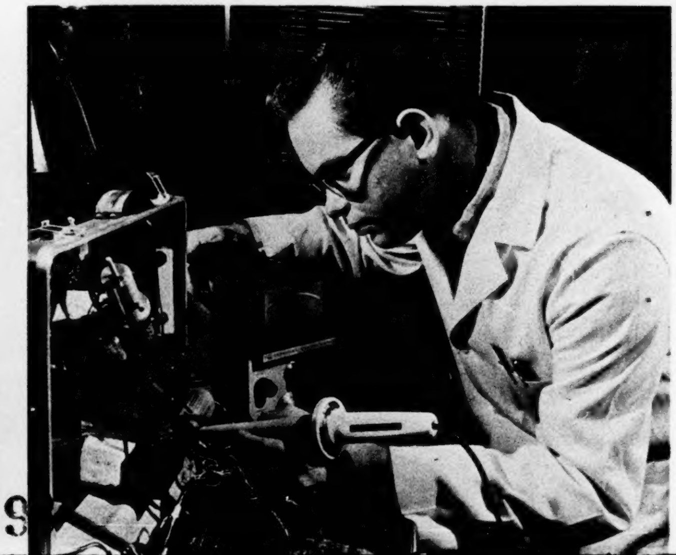
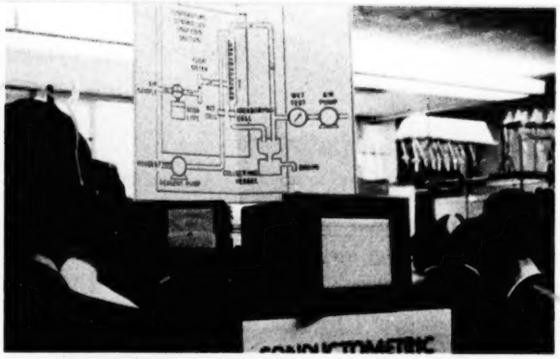




WPI ELECTRIC HYBRID

A top prize winner in the "Clean Air Car Race", this electric hybrid could be a prototype of the family car in your future.



Discussion of the operating principles of $SO_2$ analyzer during a California State Department of Public Health training conference.

California State Polytechnic College students gain experience through field studies.

California State Polytechnic College faculty member discussing laboratory measurements with students.

## **California State Polytechnic College** San Luis Obispo, California

The Environmental Engineering department of the California State Polytechnic College offers a program in air pollution control which leads to a Bachelor of Science degree. Students are trained in basic science and engineering with strong emphasis on chemistry and specific work in the design, control, and effects aspects of environmental quality. Laboratory experiments and field exercises are emphasized. The program includes the following air pollution courses:

Meteorology, I and II
Industrial Environments
Introduction to Air Pollution
Air Pollution Measurements
Environmental Radiation Surveillance
Air Pollution Control

Graduate work leading to a Master of Engineering degree will be offered beginning in the fall of 1970.

For additional information, write to the program director: Dr. Harold M. Cota, Associate Professor, Environmental Engineering, California State Polytechnic College, San Luis Obispo, California 93401.

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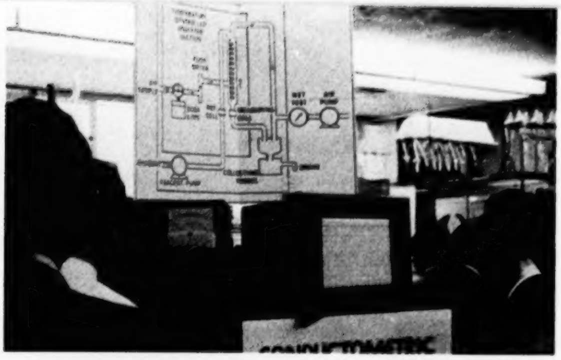

Discussion of the operating principles of $SO_2$ analyzer during a California State Department of Public Health training conference.

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California State Polytechnic College faculty member discussing laboratory measurements with students.

## College San Luis Obispo, California

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## California State Department of Public Health

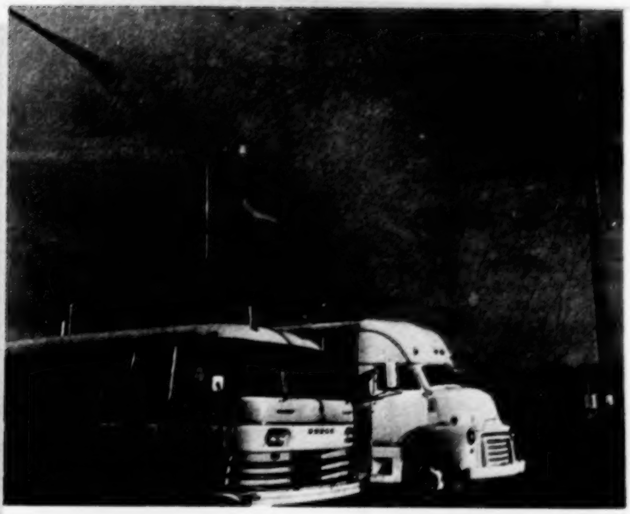
Berkeley, California

The program offered by the California State Department of Public Health provides advanced and specialized education and training. It emphasizes successful current practices and new analytical methods for assessing indoor and outdoor air pollution, focusing on specific problem areas each year.

A two-day plenary session is planned at which opportunities for formal lectures and informal discussion groups will be made available. This will be followed annually by three regional laboratory workshops, which will provide the advantages of very small group interactions. Recurring topics include maintenance and calibration of air sampling and analysis instrumentation designed for gases and aerosols, and methods for solving analytical problems related to industrial hygiene. Workshops and lectures are integrated to clarify the chemical and physical principles relevant to the significant differences caused by good and poor practices.

The program is presented with the participation and cooperation of the California Air Resources Board and the California State Department of Public Health, Berkeley, and is intended for the technical staffs of air pollution control agencies, health departments, educational institutions, instrument manufacturers and vendors, physicians, industries, and other public or private agencies concerned with air pollution problems.

For additional information, write to: Dr. Peter K. Mueller or Edward Jeung, California State Department of Public Health, 2151 Berkeley Way, Berkeley, California 94704.



Two mobile laboratories and a sampling tower are used for field studies by Penn State's air pollution trainees.

## Pennsylvania State University

Berks Campus Wyomissing, Pennsylvania

The Berks Campus offers a two-year associate degree program in air pollution control technology. Specialized and applied coursework in air resource management, air sampling and monitoring, air analysis instrumentation, and air pollution meteorology are offered, supported by appropriate chemistry, physics, mathematics, electronics, engineering, and instrumentation courses and laboratories.

Graduates of this program will be prepared to calibrate, install, and operate air sampling and monitoring equipment, investigate air pollution complaints, inspect plants, evaluate pollution sources, and perform preliminary data analyses.

Admission to the program initially is based upon high school records and student aptitute test scores indicating potential ability in an engineering technology program. Support is available for the last four terms of this six-term program based on achievement and career potential.

For further information, write to the Program Director: Dr. William J. Moroz, Center for Air Environment Studies, 226 Chemical Engineering Building II, University Park, Pennsylvania 16802.

## Pennsylvania State University

University Park, Pennsylvania

This program is designed for persons from control agencies or from industry who wish to formalize their education in air pollution or who wish to change job orientation. Some juniors and seniors in college who wish to pursue air pollution careers are admitted to the course. Up to eight credit hours may be earned during 10 weeks of intensive training in engineering and the physical sciences and the biomedical, socioeconomic, and administrative areas. Non-engineering majors are given a special engineering and physical sciences unit to review the chemical and physical principles commonly applied to air pollution control.

A basic criteria for selection is the applicant's interest in a career in air pollution control; however, his background in science, especially basic chemistry, physics, and mathematics, or equivalent experience will also be evaluated.

For further information, write to the Program Director: Dr. William J. Moroz, Center for Air Environment Studies, 226 Chemical Engineering Building II, University Park, Pennsylvania 16802.

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## Oregon Technical Institute

Klamath Falls, Oregon

Air pollution control technicians are trained in a 2-year associate degree program supported in part by a supplement to the grant to Oregon State University. Special emphasis is placed upon the training of air pollution control technicians. Students receive a sound foundation in basic sciences and instruction in air pollution measurement techniques. Standardization of sampling and analytical techniques for all common air pollutants is emphasized. High school graduates or junior college students may contact Associate Professor E. A. Wellman, Department of Environmental Health Technology, Oregon Technical Institute, Klamath Falls, Oregon 97601.

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he Program Di-
r Air Environ-
ng Building II,

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### Pennsylvania State University

University Park, Pennsylvania

This program is designed for persons from control agencies or from industry who wish to formalize their education in air pollution or who wish to change job orientation. Some juniors and seniors in college who wish to pursue air pollution careers are admitted to the course. Up to eight credit hours may be earned during 10 weeks of intensive training in engineering and the physical sciences and the biomedical, socioeconomic, and administrative areas. Non-engineering majors are given a special engineering and physical sciences unit to review the chemical and physical principles commonly applied to air pollution control.

A basic criteria for selection is the applicant's interest in a career in air pollution control; however, his background in science, especially basic chemistry, physics, and mathematics, or equivalent experience will also be evaluated.

For further information, write to the Program Director: Dr. William J. Moroz, Center for Air Environment Studies, 226 Chemical Engineering Building II, University Park, Pennsylvania 16802.

### Oregon Technical Institute

Klamath Falls, Oregon

Air pollution control technicians are trained in a 2-year associate degree program supported in part by a supplement to the grant to Oregon State University. Special emphasis is placed upon the training of air pollution control technicians. Students receive a sound foundation in basic sciences and instruction in air pollution measurement techniques. Standardization of sampling and analytical techniques for all common air pollutants is emphasized. High school graduates or junior college students may contact Associate Professor E. A. Wellman, Department of Environmental Health Technology, Oregon Technical Institute, Klamath Falls, Oregon 97601.

### Portland State College

Portland, Oregon

The Department of Applied Science offers a program of training in air pollution control at the baccalaureate and master's levels.

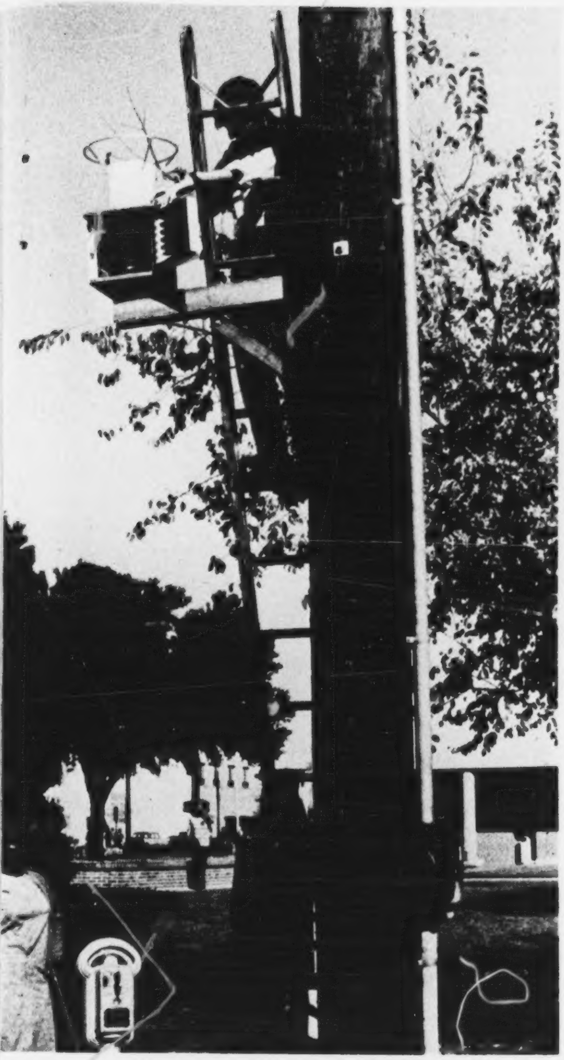
Undergraduate students in the physical sciences participate in the program by selecting air pollution courses as electives. Their training includes air conservation and meteorology, studied in their junior and senior years respectively. In the intervening summer they devote a 10-week period to in-service training with a local air pollution control agency.

Graduate students take the full sequence of air pollution control courses, plus approved electives suitable for their academic background. The M.S. degree program requires a thesis.

Air pollution related courses offered in this program include:

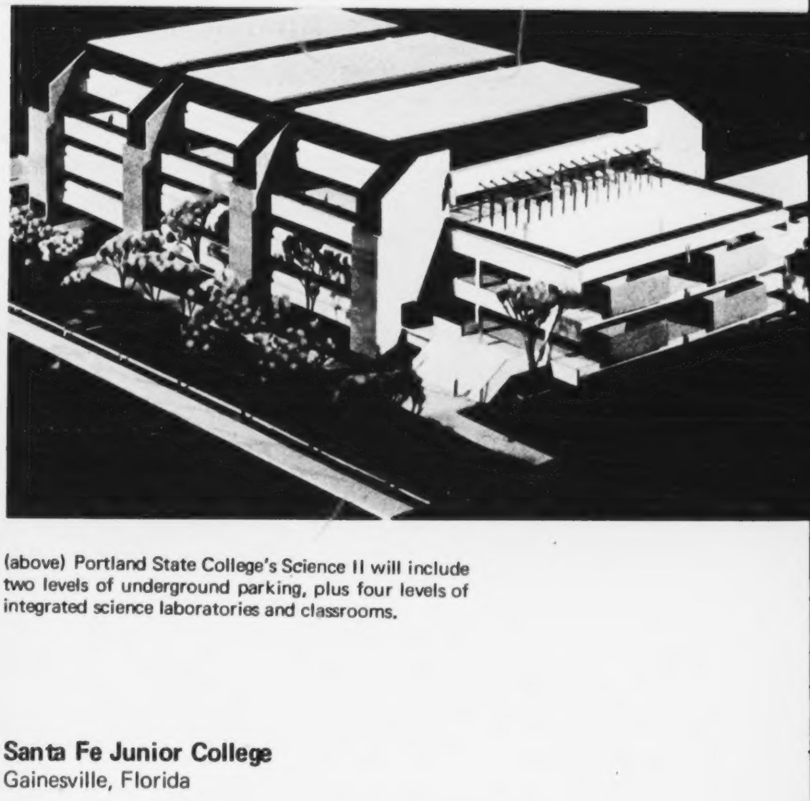
- Introduction to Air Conservation
- Aerosol Technology
- Atmospheric Reactions
- Air Pollution Instrumentation
- Projects in Air Pollution
- Air Pollution Seminar
- Meteorology

For additional information write to the Program Director: Dr. Frank P. Terraglio, Associate Professor of Applied Science, Portland State College, P. O. Box 751, Portland, Oregon 97207.



Field study with an ambient sampling shelter at Santa Fe Junior College.

(left) Instructor and students at Santa Fe Junior College Working with A.I.S.I. Sampler.



(above) Portland State College's Science II will include two levels of underground parking, plus four levels of integrated science laboratories and classrooms.

## Santa Fe Junior College

Gainesville, Florida

Santa Fe Junior College offers a 2-year training program in air pollution technology designed to produce technicians to work in industry and various health facilities.

The program includes the elements of a general college education, mathematics, chemistry, physics, and biology, with specialized training courses in air pollution control technology which are supplemented by participation in a continuing county-wide air pollution survey designed to provide field experience.

Approximately 75 course hours qualify the graduate for the Associate of Arts degree.

A special option for students interested in a 4-year program leading to a Baccalaureate degree in one of the science or engineer
an individual basis.

Air pollution related
gram include:

Introduction to Air P
Pollution Sources
Air Pollution Samplin
Air Pollution Control
Air Pollution Field S

For furthe. informat
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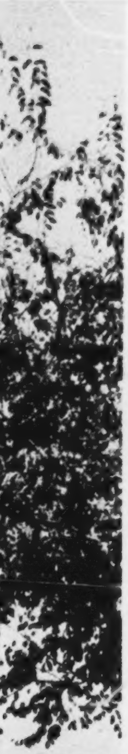
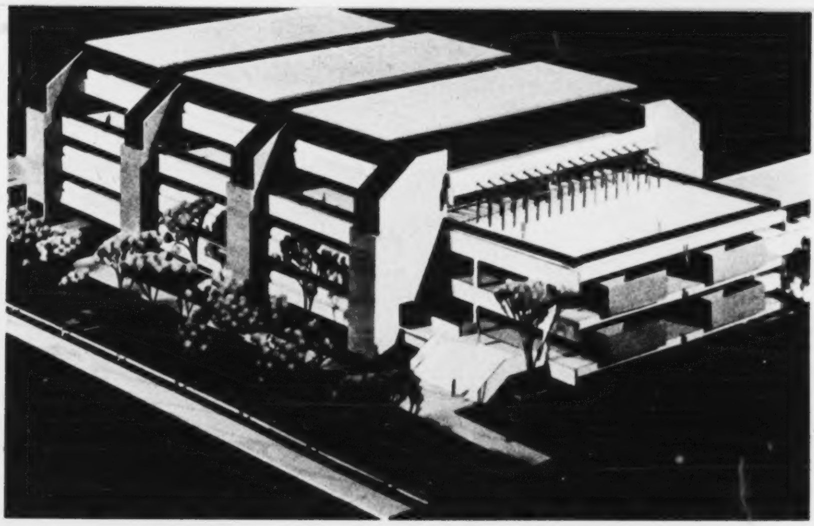
Occupations Programs; c
structor, Santa Fe Juni
sity Avenue, Gainesville,



ter at Santa Fe

Junior College



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Approximately 75 course hours qualify the graduate for the Associate of Arts degree.

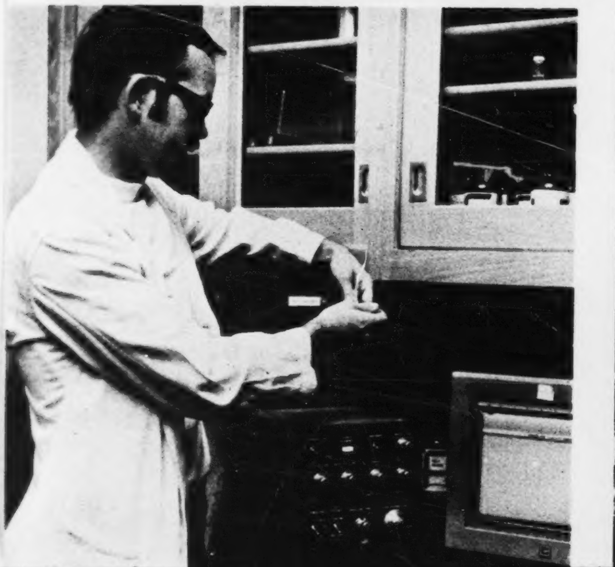
A special option for students interested in a 4-year program leading to a Baccalaureate degree in one of the science or engineering fields can be arranged on an individual basis.

Air pollution related courses offered in this program include:

Introduction to Air Pollution
Pollution Sources
Air Pollution Sampling
Air Pollution Control
Air Pollution Field Survey

For further information, write to the Program Director: Mr. Robert W. Sterling, Director, Engineering Occupations Programs; or to Mr. John M. Turner, Instructor, Santa Fe Junior College, 723 West University Avenue, Gainesville, Florida 32601.

Scientists work



(Top left) New v
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(left) Examinati
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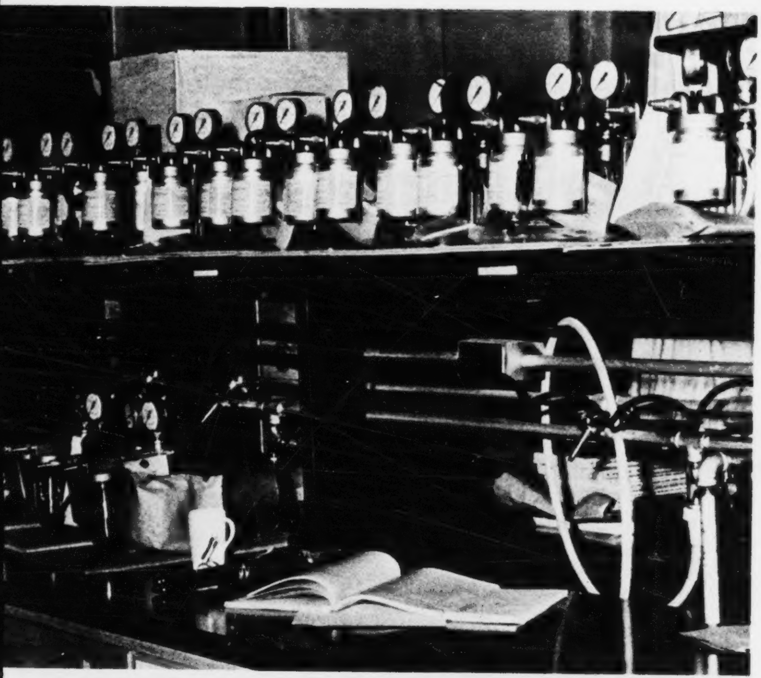
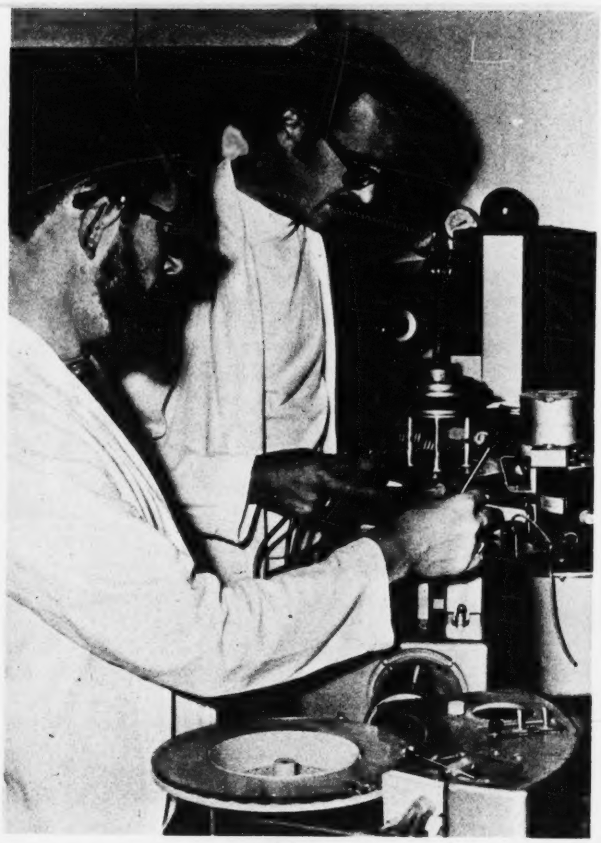
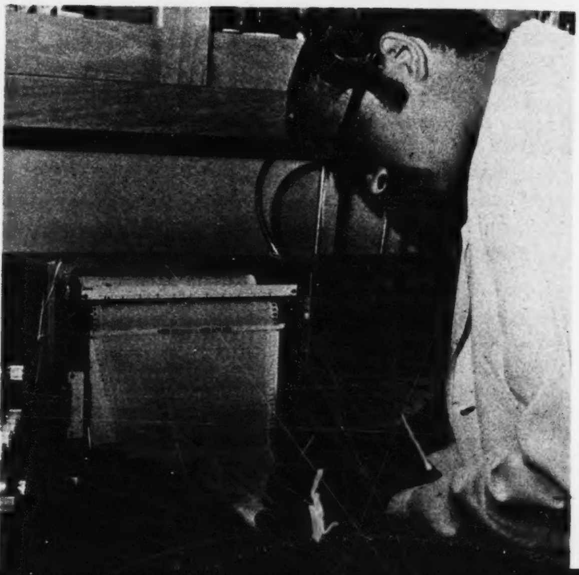




Scientists working with continuous analysis instrumentation.



(Top left) New vacuum pumps, checked upon arrival to be used in air analysis laboratory studies.

(bottom far left) A sample is injected into intake tube of a gas chromatograph in a laboratory at the Sullivan County Community College.

(left) Examination of strip chart used with the gas chromatograph.

Changing the filter on the high volume sampler in operation on the roof of a Sullivan County Community College building.

## Sullivan County Community College

South Fallsburg, New York

Sullivan County Community College is offering a special opportunity for pollution control training. During the first year, students take laboratory courses in air and water sampling and analysis that provide skills needed for entry-level technician positions in air and water pollution control. Upon receiving a diploma after the first year, the student may continue on for a second year of more general studies leading to an associate degree in applied science.

The most modern equipment, including a mobile pollution control laboratory for field work, is available. A high school diploma is not required for admittance to the program. For further information and applications write to: Mr. Lawrence Appel, Admissions, Sullivan County Community College, South Fallsburg, New York 12779.

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## Worcester Polytechnic Institute

Worcester, Massachusetts

The Environmental Systems Study Program (ESSP) is a project-based undergraduate study plan built upon contemporary environmental problems. Using the systems approach, the development of a solution to those problems provides the main thrust of the student learning experience. Special emphasis is placed upon air pollution control problems encountered by government and industry.

Interdisciplinary project teams are selected from engineering, science, and social science students in their junior year. Teams, consisting of three-to-five students under the direction of a faculty advisor, pursue the following study sequence:

Spring Term – Preparatory Course
Students study general environmental problems, project management, systems analysis and design techniques. The laboratory portion of this cour serves to familiarize the student with equipme and techniques in preparation for his participatic in a project.

Summer Term – Internship
Students execute project objectives outlined du ing the preparatory course.

Senior Year – Design
Students will take two in-depth courses dealir with the solution of the problem: one from th disciplinary point of view and the other in th overall systems concept.

Reporting – upon completion of the sequence th student group submits written and oral reports c their findings and solutions to the faculty an sponsors.

Elective Courses – concurrent with the project s quence described above, students individuall choose electives from courses offered by Worceste Polytechnic Institute and environmental course offered at neighboring institutions of the Worce ter Consortium for Higher Education.

A student establishes a sub-major by studying sequence of five or more courses chosen from thos offered in the environmental areas. This sequenc supplements his disciplinary major and enables th graduate to function as an environmental speciali within his chosen career.

For additional information, write to Program D rector: Dr. Imre Zwiebel, E.S.S.P., Worcester Poly technic Institute, Worcester, Massachusetts 01609.

# Fellowships

## General Information

As authorized by the Clean Air Act of 1970, the Environmental Protection Agency's Office of Air Programs has established a grants-in-aid program to increase the number and competence of professional personnel engaged in research and other activities related to the prevention and abatement of air pollution.

A limited number of one year fellowships will support individuals employed by State or local air pollution control agencies for study in such fields as urban and transportation planning, economics, political science, public affairs, and air pollution control.

Air pollution fellowships are awarded and administered in accordance with the following policies and procedures.

## Requirements:

A fellow must be a citizen of the United States, a non-citizen national of the United States, or have been lawfully admitted to the United States for permanent residence. An applicant who is not a United States citizen or a non-citizen national must request the Office of the Immigration and Naturalization Service nearest his residence to verify that he was lawfully admitted to the United States for permanent residence. The request to the Immigration and Naturalization Service must be made on that agency's form N-585, available in any Immigration and Naturalization Service office.

## Qualifications

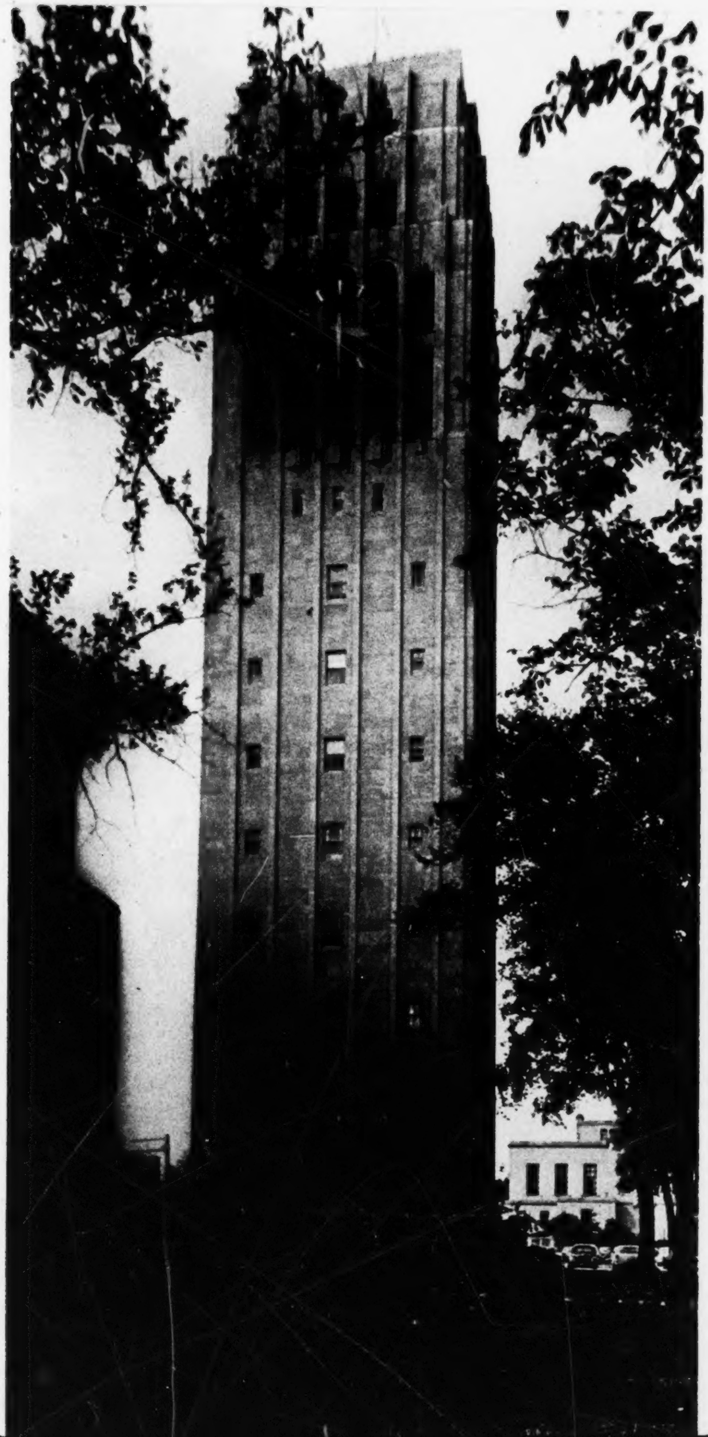
To qualify for a fellowship, an applicant must have a bachelor's degree from a recognized institution or equivalent experience, and must be accepted for admission by an appropriate educational institution.

In awarding the fellowship, consideration will be given to the adequacy, value and appropriateness of the program to be followed, and the qualifications, interest, and potential contribution of the applicant.

## How to Apply

Applications for air pollution fellowships may be obtained from any of the ten Regional Offices of the Environmental Protection Agency (listed pp. 10-11) or from the Chief, Special Projects Branch, Manpower Development Staff, Office of Air Programs, Research Triangle Park, North Carolina 27711.

Notification is given approximately two weeks after review of application.



**Effective July 1, 1972 a tuition charge of 90 dollars – per day, per student – will be made for Institute for Air Pollution Training Courses. Additional information regarding fees will be furnished by the Registrar's Office.**

Early application is advised, because course rosters are limited. Students must be registered at least two-weeks in advance of course starting date in order to receive and complete pre-course learning materials. Trainees are expected to provide for their own housing and transportation while attending courses. To provide training service to a maximum number of organizations, the number of applicants from a single agency, for any one course, may be necessarily limited.

# HOW TO APPLY FOR ADMISSION TO INSTITUTE FOR AIR POLLUTION TRAINING COURSES

- **Please fill out both sides of the application form.**
- **A separate form for each course is requested.**

Additional application forms may be obtained from any Regional Office. (see pages 10 and 11) or from the Registrar of the Institute for Air Pollution Training

- **Please mail forms to:**

Registrar,
Institute for Air Pollution Training,
Research Triangle Park, North Carolina 27711
Telephone: (919) 549 - 8411

(detach here)

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY

# COURSE APPLICATION FORM

**1. Name of Applicant:** Mr. Miss Mrs. ______________________ (last) ______________________ (first)

**Course Title** ______________________

● **2. Course desired:**

**Place where given** ______________________ **Dates** ______

**Course Title** ______________________

● **3. Previous courses attended:**

**Course Title** ______________________

**Course Title** ______________________

**4. Sponsor or Employer:**

______________________ (name of organization or firm)

______________________ (street address)

(city) ______________________ (state)

**5. Mailing address of applicant:**
**(if different from above)**

______________________ (street address)

(city) ______________________ (state)

● **Please fill out both sides**

128NCAP–46
3–68

Form Approved
OMB
No. 158-R0005

UNITED STATES · ENVIRONMENTAL PROTECTION AGENCY

TECTION AGENCY

# APPLICATION FORM

**Mr.**
**Miss** ____________________ (last) ____________________ (first) __________ (middle initial)
**Mrs.**

**Course Title** ______________________________ **Course No.** __________

**Place where given** ______________________________ **Dates** __________

**Course Title** ______________________________ **Dates** __________

**led:**

**Course Title** ______________________________ **Dates** __________

**Course Title** ______________________________ **Dates** __________

________________________________________
(name of organization or firm)

________________________________________
(street address)

________________________________________
(city) (state) (zip code) (telephone)

**cant:**
**ve)**

________________________________________
(street address)

________________________________________
(city) (state) (zip code) (telephone)

102

● **Please fill out both sides of the application form.**

Certificates will be awarded to those students who satisfactorily complete all course assignments and who attend all scheduled presentations (including where applicable, evening, Friday afternoon and Saturday sessions).

______________________________ (profession or occupation)

______________________________ (position title)

**6. Professional Status:**

Brief description of your present position ______________________________

______________________________

______________________________

Effective July 1, 1972 a tuition charge of 90 dollars — per day, per student — will be made for courses conducted by the Institute for Air Pollution Training.
Additional information regarding fees will be furnished by the Registrar's office.

**7. Education:**

Number of years education completed beyond high school ______

| | | | |
|---|---|---|---|
| (college or university) | (date attended) | (Major) | (Degree) |
| | | | |
| | | | |
| | | | |

**8. Professional Experience:**

Total years experience in profession, including all public health experience ______

Total years of air pollution control experience ______

No substitution of students can be made in any course without an accompanying application form. Each student must be approved (prior to the course starting date) by the Course Director.

______________________________
(Signature of Approving Officer (where applicable)) Title

______________________________
Signature of Applicant Date

Mail to: Registrar,
Institute for Air Pollution Training
Research Triangle Park, North Carolina 27711
Telephone: (919) 549-8411

(detach here)

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY

# COURSE APPLICATION FORM

**1. Name of Applicant:** Mr. Miss Mrs. ____________________ (last) ____________________ (firs

**2. Course desired:**

Course Title ____________________

Place where given ____________________ Da

**3. Previous courses attended:**

Course Title ____________________

Course Title ____________________

Course Title ____________________

**4. Sponsor or Employer:**

____________________ (name of organization or firm)

____________________ (street address)

____________________ (city) (state)

**5. Mailing address of applicant: (if different from above)**

____________________ (street address)

____________________ (city) (state)

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**Please fill out both s**

Form Approved
OMB
No. 158-R0005

L PROTECTION AGENCY

# SE APPLICATION FORM

nt: Mr. Miss Mrs. ____________________ (last) ____________________ (first) ____________________ (middle initial)

Course Title ____________________ Course No. ____________

Place where given ____________________ Dates ____________

Course Title ____________________ Dates ____________

Course Title ____________________ Dates ____________

attended:

Course Title ____________________ Dates ____________

____________________ (name of organization or firm)

oyer: ____________________ (street address)

____________________ (city) (state) (zip code) (telephone)

____________________ (street address)

f applicant:
n above) ____________________ (city) (state) (zip code) (telephone)

**Please fill out both sides of the application form.**

Certificates will be awarded to those students who satisfactorily complete all course assignments and who attend all scheduled presentations (including where applicable, evening, Friday afternoon and Saturday sessions).

______________________________ (profession or occupation)

______________________________ (position title)

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Brief description of your present position ______________________________

______________________________

______________________________

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Number of years education completed beyond high school __________

| | | | |
|---|---|---|---|
| (college or university) | (date attended) | (Major) | (Degree) |

**7. Education:**

______________________________

______________________________

______________________________

**8. Professional Experience:**

Total years experience in profession, including all public health experience __________

Total years of air pollution control experience __________

**No substitution of students can be made in any course without an accompanying application form. Each student must be approved (prior to the course starting date) by the Course Director.**

______________________________
(Signature of Approving Officer (where applicable)) Title

______________________________
Signature of Applicant Date

**Mail to:** Registrar,
Institute for Air Pollution Training
Research Triangle Park, North Carolina 27711
Telephone: (919) 549-8411

(detach here)

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY

# COURSE APPLICATION FORM

1. **Name of Applicant:** Mr. / Miss / Mrs. ____________ (last)

2. **Course desired:**
   Course Title ____________
   Place where given ____________

3. **Previous courses attended:**
   Course Title ____________
   Course Title ____________
   Course Title ____________

4. **Sponsor or Employer:**
   ____________ (name of organization or firm)
   ____________ (street address)
   ____________ (city) ____________ (state)

5. **Mailing address of applicant: (if different from above)**
   ____________ (street address)
   ____________ (city) ____________ (state)

128NCAP–46
3–68

● **Please fill out bot**

Form Approved
OMB
No. 158-R0005

UNITED STATES · ENVIRONMENTAL PROTECTION AGENCY ·

PROTECTION AGENCY

# SE APPLICATION FORM

nt: Mr. Miss Mrs. ____________ (last) ____________ (first) ____________ (middle initial)

Course Title ____________ Course No. ____________

Place where given ____________ Dates ____________

Course Title ____________ Dates ____________

ttended: Course Title ____________ Dates ____________

Course Title ____________ Dates ____________

____________ (name of organization or firm)

yer: ____________ (street address)

____________ (city) (state) (zip code) (telephone)

applicant: above) ____________ (street address)

____________ (city) (state) (zip code) (telephone)

● Please fill out both sides of the application form.

● Certificates will be awarded to those students who satisfactorily complete all course assignments and who attend all scheduled presentations (including where applicable, evening, Friday afternoon and Saturday sessions).

(profession or occupation)

(position title)

**6. Professional Status:**

● Brief description of your present position

● Effective July 1, 1972 a tuition charge of 90 dollars — per day, per student — will be made for courses conducted by the Institute for Air Pollution Training.
Additional information regarding fees will be furnished by the Registrar's office.

Number of years education completed beyond high school

| | | | |
|---|---|---|---|
| (college or university) | (date attended) | (Major) | (Degree) |

**7. Education:**

**8. Professional Experience:**

Total years experience in profession, including all public health experience

● Total years of air pollution control experience

● No substitution of students can be made in any course without an accompanying application form. Each student must be approved (prior to the course starting date) by the Course Director.

(Signature of Approving Officer (where applicable)) Title

Signature of Applicant Date

● Mail to: Registrar,
Institute for Air Pollution Training
Research Triangle Park, North Carolina 27711
Telephone: (919) 549-8411

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*Please use the space below to indicate personnel*
*to be included on future mailing lists.*

Harry P Kramer
Director,
Manpower Development Staff

● *Mail to: Registrar*
*Institute for Air P*
*Research Triangle*

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Mr.
Miss
Mrs. (last name) (first name) (middle initial)

(profession) (title)

(street address)

(city) (state) (zip code)

Mr.
Miss
Mrs. (last name) (first name) (middle initial)

(profession) (title)

(street address)

(city) (state) (zip code)

Mr.
Miss
Mrs. (last name)

(profession)

(street address)

(city)

Mr.
Miss
Mrs. (last name)

(profession)

(street address)

(city)

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also be interested in these training opportunities.
personnel

Harry P Kramer
Director,
Manpower Development Staff

*Mail to: Registrar*
*Institute for Air Pollution Training*
*Research Triangle Park, North Carolina 27711*

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**(first name)** **(middle initial)**

**(title)**

**(state)** **(zip code)**

**(first name)** **(middle initial)**

**(title)**

**(state)** **(zip code)**

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**Miss**
**Mrs.** **(last name)** **(first name)** **(middle initial)**

**(profession)** **(title)**

**(street address)**

**(city)** **(state)** **(zip code)**

**Mr.**
**Miss**
**Mrs.** **(last name)** **(first name)** **(middle initial)**

**(profession)** **(title)**

**(street address)**

**(city)** **(state)** **(zip code)**

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**Registrar,**
**Institute for Air Pollution Training,**
**Research Triangle Park, North Carolina 27711**
**Telephone: (919) 549 - 8411**

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8¢ stamp
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**Institute for Air Pollution Training,**
**Research Triangle Park, North Carolina 27711**
**Telephone: (919) 549 - 8411**

# CHANGE OF ADDRESS FORM

(fold here and detach)

Mr.
Miss
Mrs. (last name) (first name)

(profession) (titl

(name of organization or firm)

**Your old address**

(street address)

(city) (state)

**Please fill in both parts**
**of the form on this page**
**fold form along this dotted line and mail to**
**Registrar**
**Institute for Air Pollution Training**
**Research Triangle Park, N.C. 27711**

Mr.
Miss
Mrs. (last name) (first name)

(profession) (titl

(name of organization or firm)

**Your new address**

(street address)

(city) (state)

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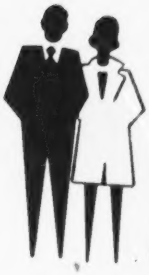

# CHANGE OF ADDRESS FORM

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Miss
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(profession) (title)

(name of organization or firm)

**Your old address**

(street address)

(city) (state) (zip code)

nd mail to

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711

Mr.
Miss
Mrs. (last name) (first name) (middle initial)

(profession) (title)

(name of organization or firm)

**Your new address**

(street address)

(city) (state) (zip code)

- 1401

Please mail both parts of change of address form
showing your old address and your new address to
Registrar,
Institute for Air Pollution Training
Research Triangle Park, North Carolina 27711

U.S. Environmental Protection Agency
Forms and Publications Center
Highway Number 70, West
Route #8, Box 116
Raleigh, N.C. 27612

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